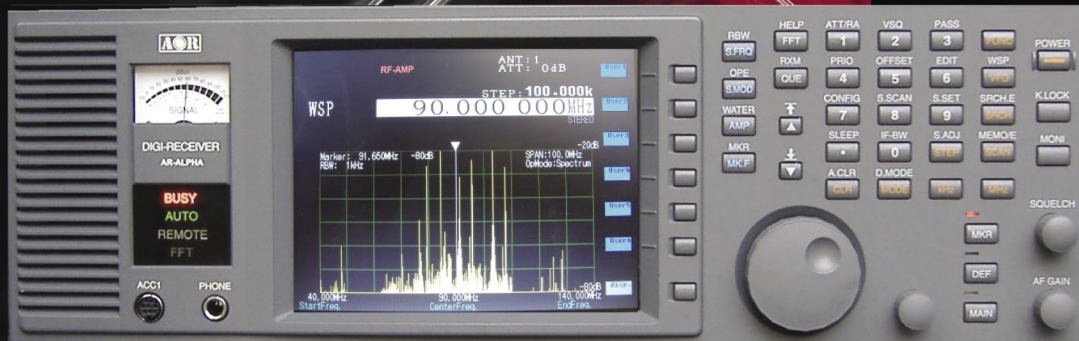# Storm Chasing
with
Amateur Radio

In this issue:

- Exploring 10 Meter Beacons
- Start Your Own SW Station!
- Make a Hard-Hat Antenna
- Head-to-Head: Four Mid-Priced Portables

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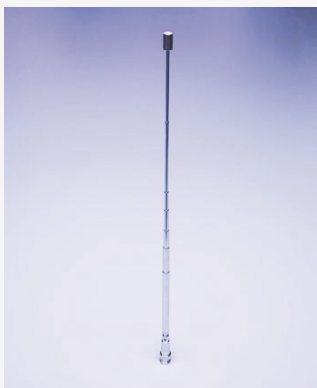
WR-AX-06B
Telescopic VHF/UHF antenna
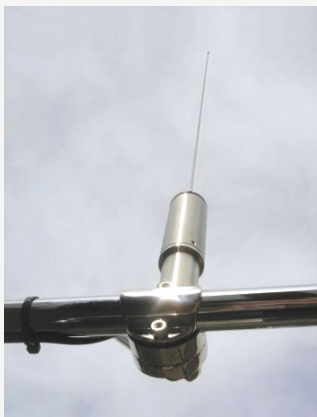
WR-AX-81S
High intercept point active HF antenna

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Accessories

WR-LWA-0130
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Volume 26, No. 5
May 2007

U.S. $5.95
Printed in the
United States

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Lead Story

Storm Chasing
By Seth Price

It's nothing like the movies, says Seth Price: Dodging flying cows isn't usually a factor in storm chasing, but bad food and boredom certainly are. Amateur radio is a real gift on two counts: visiting with hams around the country during inactive periods helps pass the time and provides a service for hams looking to make a contact with often sparsely-populated counties, but amateur radio is also a vital link in the SKYWARN nets that provide ground-truth information to the National Weather Service during severe weather.

For a taste of what storm chasing is really like, and information on how to get trained as an amateur radio operator and a weather spotter, turn to the article on page 8.

Cover photo courtesy NOAA Photo Library, NOAA Central Library; OAR/ERL/National Severe Storms Laboratory (NSSL)

CONTENTS

By Bill Brown

"The higher the better" is the mantra hams use whenever they talk about their antennas. Some hams take that concept to the extreme by launching satellites. Others like Bill Brown dabble with transmissions from Near Space by means of Amateur Radio High Altitude Balloons (ARHAB). The "payload" may be a simple transmitter or it may be combined with other experiments. Tracking the balloon to retrieve the payload requires skill in direction-finding and using FAA winds aloft data to predict the landing zone. Turn to page 12 to see the one that almost landed in **MT**'s back yard!

By Ken Reitz

How can you tell if a band is dead if no one is talking? Dozens of 10-meter aficionados have made sure that's not a problem on their watch: The 10 meter band is populated with low-powered beacons which transmit their signals day and night, year after year. Tune in to a few of the most popular frequencies and you can quickly tell whether the band is open or not. Over time, you can learn a lot about propagation, you can test your equipment, and you can make maximum use of your time on the air.

By Gregory Smith

You may wax nostalgic about the smell of smoking flux and burned wire insulation, but solder as we know it is changing. The tin-lead composition which has served the electronics industry so well is being phased out for non-critical applications, due to concerns over hazardous waste. Trouble is, the new alloys have a higher failure rate for a variety of reasons.

You can still can use the old leaded alloys in construction projects, but we thought you'd like to know what may be behind increased equipment failures in modern electronics. When you say "they don't make them like they used to," you're right. But it's for a good reason.

Reviews

Lately we've been reviewing several low and mid-priced portables. This month a new player gets into the game. Todd Van Gelder compares four of the more popular portables together – the Grundig G4000A, Kaito 1103, Grundig G5, and the Sony ICF-SW7600GR. We think you'll find the overview quite useful (page 66)

Uniden has released the BC-RH96 remote control head which works with the Uniden BCD996T and BCT15 base/mobile scanners, and the BCD396T and BR-330T handheld scanners. The nearly full-featured head allows increased options for mounting your scanner in a vehicle, and easy removal to prevent theft. See page 69 for the full review.

Mac users, listen up! John Catalano has been temporarily forced to use an Apple Macintosh computer, and you are the beneficiaries. This month you can read about five noteworthy radio programs which operate on the Mac computer (see page 72).

Disclaimer:
While *Monitoring Times* makes an effort to ensure the information it publishes is accurate, it cannot be held liable for the contents. The reader assumes any risk for performing modification or construction projects published in *Monitoring Times*. Opinion or conclusions expressed are not necessarily the view of *Monitoring Times* or Grove Enterprises. Unsolicited manuscripts are accepted. SASE if material is to be returned.

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Digital Wires Crossed

The screenshot in the April edition of "Digital Digest" was supposed to be the RFSM2400 program decoding MIL-188-110A. Unfortunately, what we showed you was a MIL-STD-188-203-1A, or Link 11, screenshot intended for the May issue. Following is the screenshot of the Russian software program and the correct decode for April. We apologize for the confusion!
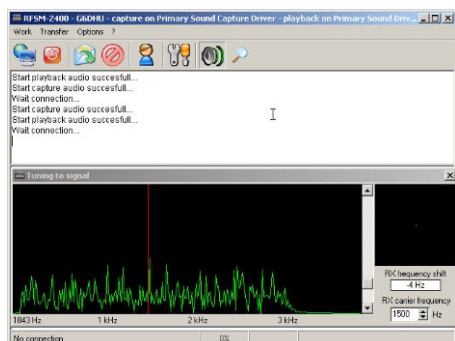
MT at Winterfest

The 20th Winter SW Festival in Kulpsville, PA, has come and gone (see feature article in March 2007 *MT*), leaving behind good memories, new knowledge and new friends. At the banquet, supporters from the early days of the Fest were acknowledged, including Grove Enterprises and Universal Radio, both of whom donated prizes for the very first and every subsequent year. Your editor, Rachel Baughn, was honored to accept the plaque on behalf of Grove Enterprises.

Harmony on the Ham Bands

"I guess I could not agree more with your article, '*Waking the Dead, Unruding the Rude.*' [Now available on line at **www.monitoringtimes.com/html/mtham.pdf**] I live in the Denver area and while not as bad (at least I hope you are not talking about this area) as the situation you describe, there are definitely some snotty 2M repeaters around where it feels like a group of friends are just talking to each other, and outsiders – or even people actively trying to get inside – are treated indifferently or with hostility. This one small group in particular acts like it owns the repeater and snippily 'lays down the law' to anyone who is new or isn't quite up to snuff on a protocol; for example, letting squelch tails tail off between calls – a characteristic of an Echolink repeater you wouldn't know about until you had encountered it.

"I've found it extremely difficult to try and get connected with the '2 meter people' even though I attend every club meeting and have even offered to help them with some of their projects. ... It almost feels like the hams here are 'protecting a territory.' Not sure exactly what it is. I was kind of happy to find modes like PSK31 on HF – people there seem much more friendly.

"I think your suggested antidote of reaching out to new people is the right prescription and hope that your article reaches the right audience. I do think ham radio is in a state of transition – it will be interesting to see if it can remain relevant in the future. I hope it does, I love this hobby."
– Robert White K0RCW

Regarding what to talk about on the air (February 2007 *Ham Bands*): "Too bad that there are not more enlightened and broadly-based hams like you. I could have become a ham about 55 years ago, but the vast majority of conversations I overheard never got beyond 'gear' and weather. I stayed an SWL and to this day, have not been motivated to get a ticket. I'm fond of electronic gear and have enjoyed living through a very exciting time (from crystal sets to trunking scanners – I now own two scanners, a good SW receiver, stereo, iPod, Shuffle, etc.) but I still find that the average ham has little to talk about. I hope that your *M/T* piece will have a major effect on the hobby."
– Maury Midlo

Radio Cats!

From John Musgrave, Oona River, BC, Dec 24: "I often wonder about the connection between cats and radios. I was thinking about cats and Fessenden, who loved cats – like me.

"Of course, in the days of tube radios cats did stake-out tons of radios as warm places to snooze. Somewhat safer than warm radiators of parked cars!

"Certainly back in '52-'53 I can remember the family tomcat 'Fluffy,' a Persian, lounging on top of the Eddystone radio.

"One sports-fishing camp I 'watched' over winters in the 1980s had a Siamese black and white neutered tom called Dave. He was extremely smart, left-pawed, but very dexterous.

"He used to lay on the shelf above my Realistic DX302, reach down, and crank the tuning-knob (kHz) which had a little handle. This used to startle visitors. He did reach the state of being able to tune a station in – he'd crank by a station, stop, crank back until he got best signal.

"I think mainly he liked to watch the red LEDs change. Sadly, on Dec 24 he died of FUS (Feline Urological Syndrome) – it was too stormy for planes to fly, so we couldn't get him to a vet.

"Certainly I've see photos of readers' 'set-ups' in *MT* with cats attached to the radios, with such statements as 'I know for a fact the radios work better with the cat attached.'

"Universal Radio seem to have cats on the payroll.

"So, today we celebrate 100 years of voice broadcasting – with the first being from shore to 'all the ships at sea'!"

To prove John's point, here's another of those shack photos – This one came in several years ago from Howard Klann KD8ABP of Calumet, Michigan, but it never got published. Howard says, "I have a radio shack buddy..... Misty likes to come in and watch and lis-

ten....." Equipment includes Yaesu FT-897D, 8900R, YS-500, G-450A, Drake R8-B, Icom-V8, RCI-2995DX, MFJ 949E, 989C, Diamond GZV4000.

Hello from Canada

In the February *MT Help Desk* column, Randy True asked about a filter that would pass only 225-400 MHz, blocking frequencies above and below that military aircraft range. A. Humphrey from Colborne, Ontario, replies:

"I think maybe cable TV may have an answer, as they installed a filter on my cable to block out reception on certain channels I get above and below." (Bob Grove concurs that's a good possibility.)

He is also looking for information: "I need a copy of an owner's manual for a Radio Shack 1978 Kit SW regen receiver 3 transistor Science Fair Globe Patrol Cat. No. 28-205. Mine works perfectly on all frequencies AM+SSB. I added a fine tune knob on main tuning shaft.

"Also: Any information on a Philips Opal car radio 6 volt portable, white plastic case, pushbuttons. Coverage 200 meters-2000 meters." (150 kHz-1500 kHz)

Mr. Humphrey has been an electronics technician and experimenter since his teenage years, has owned and built many kinds of radios and antennas. He has reasonable reception of shortwave and mediumwave broadcasts, amateur HF, scanning NY state and Ontario. Though a relative youngster at 60, he is retired due to poor health, but he would still like to be of use to any *MT* reader who is willing to use snail mail.

Anyone who has information on the above equipment, or who would like to exchange scanner frequencies for the Rochester/Buffalo area for Ontario frequencies, or who would like to ask A. Humphrey a question about radio or electronics may write him at the following address: 6 Percy St., Apt 116, Colborne, ON K0K 1S0 Canada.

Kentucky Music Hall of Fame

"This past summer ('06) I visited the Kentucky Music Hall of Fame and Museum in Renfro Valley. Of interest to radio buffs like me was the old radios, radio equipment (microphones, etc), WHAS display and WRVK display. WRVK studio and tower is just up the road and there is a TIS station down the road a ways.

"Well worth a visit. Located off I-75 between London, KY, and Berea. The '*Sunday Mornin' Gatherin*' radio program originates weekly in the Old Red Barn."

– R.C. (Col. DX) Watts

BROADCASTING

VOA English Broadcasts Slashed

Eleven former directors of the Voice of America have issued a joint statement calling on Congress to reverse a Bush administration plan to substantially reduce VOA's English broadcasts and those in 15 other languages.

"The Bush administration has proposed to eliminate VOA English in every continent except Africa, abolish services in Cantonese, Croatian, Georgian, Greek, Thai and Uzbek, cease radio broadcasts in Russian, Ukrainian, Serbian, Albanian, Bosnian, Macedonian, and Hindi (to India), and significantly scale back programming in Tibetan and Portuguese to Africa."

The statement concludes, "We urgently appeal for an increase of the proposed $178 million VOA budget to $204 million for fiscal year 2008 beginning October 1 ... Surveys show anti-American opinion abroad to be at an all-time high. At this critical moment in the post 9/11 era, the United States simply cannot, for its own long term strategic safety and security, unilaterally disarm in the global contest of ideas."

Webcasting in Trouble

Much of the buzz at this year's Winterfest centered around streaming audio on the internet substituting as "the new shortwave radio" of the near future. Webcasting also provides a legal outlet for small-time broadcasters who otherwise might be tempted to broadcast as an unlicensed pirate station. The little Acoustic Energy internet radio caught the imagination of 'Fest attendees as the push of a button brought in remote stations, whether a US domestic station or a broadcaster from Africa or Asia. To this editor's eye, streaming audio appears to be the most promising solution to the sameness on the domestic radio dial and the disappearance of shortwave broadcasting to North America.

However, a new ruling by the Copyright Royalty Board (CRB) could put an end to music streaming originating in the U.S. On March 2nd, CRB announced a new scale to replace the old fee system, which based music royalties on a percentage of revenue and audience reach. The new system will charge all webcasters a flat fee (with little special consideration for public broadcasters). Worse, it is retroactive to the beginning of 2006, landing some non-commercial stations like University of Pennsylvania's WXPN with an outstanding bill of $1 million or more! For many small or nonprofit broadcasters, the fee amounts to more than 100 percent of the station's annual revenue and will effectively put them out of business.

Contrary to rewarding artists and labels with increased revenue, the move is likely to backfire by shutting down the one place where many new artists garner exposure and sales. This column has previously mentioned noncommercial broadcaster KCRW-FM in Santa Monica, whose internet audience greatly outnumbers its over-air audience. Both WXPN and KCRW are known for giving airtime to artists and music outside of the mainstream – and their internet stream may even play artists that aren't given airtime. While the royalties were presumably determined with such artists' benefit in mind, the financial reality would end up suppressing the music that needs the exposure the most.

For an excellent background on copyright law and how it has changed over the years, as well as what went wrong in the CRB's deliberations, see **www.kurthanson.com/archive/news/031607/index.shtml** And do write your Congressman, because that's likely where this dispute will end up.

What's Wrong with this Picture?

At a time when internet stations are being required to pay 10 times the royalty owed by terrestrial broadcasters for giving a song airplay, four major broadcast companies have agreed to pay the government $12.5 million for doing just the opposite. These companies accepted remuneration from record labels in exchange for playing the label's music. Crazy world, isn't it?!

(Terrestrial stations pay royalties to the composer, but not to the label or performing artist(s). That may also be about to change.)

FCC Approves IBOC Rules

Digital terrestrial radio rules have now been finalized by the Federal Communications Commission. AM stations, previously limited to daytime-only digital operation, will be allowed to run their digital signals at night.

Stations must offer at least one free-to-air program stream, simulcasting their analog signal. Digital-only stations will not be allowed at this time. No deadline was set for shutting down analog radio and going digital-only.

Doug Smith, *MT's American Bandscan* columnist said, "Many of the 50kW clear-channel stations are already equipped for IBOC and will likely begin operating at night as soon as the rules go into effect. The likely result will be massive interference in the 640-1220 and 1500-1580 kHz bands." See his blog at **www.americanbandscan.blogspot.com** for more on this story.

Police Confiscate Shortwave Radios

BBCMS, via Clandestine Radio Watch #220, notes that **Short Wave Radio Africa** reported in December that local police in Mataga, Zimbabwe, are confiscating shortwave radios distributed by the "Radio Communication Project." That project donates solar-powered and wind-up shortwave receivers to rural residents so that they can receive foreign radio broadcasts that are independent of "state propaganda." According to this report, Zimbabwean authorities are confiscating shortwave radios within the country on a widespread basis.

Who said that shortwave radio was dead? The Zimbabwean government doesn't believe it. (*Story coutesy of Outer Limits column.*)

TV Marti Executive Pleads Guilty

The *Miami Herald* newspaper reported in November that Jose M. Miranda, a senior executive at **TV Marti,** was indicted for taking over $100,000 in kickbacks from production vendors having contracts with the anti-Castro television network funded by the United States. One vendor involved in the indictment was Perfect Image Film and Video Productions. Miranda's position at **TV Marti** involved selecting and acquiring programs for broadcast on the station.

But, an internal review of this story by the *Miami Herald,* as reported in *Editor and Publisher,* found that on different occasions other Washington journalists have taken money payments from shortwave broadcasters including the **Voice of America**. The fact that journalists are sometimes taking payments from governments to produce "independent" news coverage obviously compromises the independence of the news coverage from some journalists.

Miranda pled guilty federal court in mid-February to "unlawfully participating in government matters in which he had a financial interest." Sentencing was scheduled in late April after the deadline for this month's *MT.*

We can unequivocally report that the "Outer Limits" column in *Monitoring Times* receives no payments from any government broadcaster in any country. (*Story courtesy of Outer Limits column.*)

San Francisco Liberation Radio Appeals

San Francisco Liberation Radio has appealed the seizure of its equipment by the FCC in October 2003. The *San Mateo County Times* reports that 2007 legal arguments revolved around whether the station received due process of law during the bust. The 9th US District Court of Appeals held a late winter hearing on this case in California.

Senior Circuit Judge Betty Fletcher suggested that the station should lobby the Congress to change broadcasting laws, but the 9th District court still had the appeal on due process issues under review at press time for *MT*. Meanwhile, the station retains an internet podcast presence via a new web site at **www.liberationradio.net/listen/** but is not broadcasting on FM currently. (*Story courtesy of Outer Limits column.*)

Spies Sentenced

Despite apologizing for a secret life of informing on Miami's exile community for Cuba, convicted ex-Florida International University academics Carlos and Elsa Alvarez received maximum sentences in February. Carlos Alvarez received the maximum five-year prison sentence for conspiring to act as an unregistered Cuban agent and Elsa Alvarez received the maximum three years' imprisonment for harboring her husband's illicit intelligence work and failing to report it to authorities.

Elsa Alvarez said her husband's goal was to "help Cubans to become unified" on both sides of the Florida Straits. "I believe Carlos acted in good faith at all times," she added.

In sentencing them, Moore condemned them for breaking federal law with their "personal foreign policy." But the Alvarezes and their lawyers kept insisting the information passed along to Cuban agents was "innocuous" and ''harmless gossip,'' causing "no harm" to the United States or the exile community.

At sentencing, prosecutor Matthew Axelrod said they both relied on shortwave radios, computers and encrypted information to correspond with their Cuban intelligence handlers and also traveled to Cuba and other countries to meet them.

Compensation to Consumers?

When automatic garage door openers in your neighborhood suddenly start malfunctioning, who do you blame? Savvy *MT* readers know it's (all together, now) "military LMR radio systems." Once "borrowed" on a non-interference basis, the military is repopulating these relatively vacant channels with new base communications systems.

One widow on a fixed income near Quantico felt she should get some kind of hardship compensation for being required to purchase a new receiver and remote for her garage door opener. Seems a valid point to us, but it's not due from the Dept of Defense; any manufacturer using those military frequencies had to know it was a gamble.

Herman Munster's Ham QSO

Ulis Fleming forwards an interesting episode with actor Fred Gwynne from an ancient television episode of **The Munsters** as he clumsily attempts a ham radio contact. The scene opens at an FCC district office, where the FCC makes the mistake of approving Herman Munster's application for a ham radio license. They appar-

ently were not busting pirates that day. Herman's two-way radio contact and his antique equipment are amusing. You can view it yourself at **www. youtube.com/watch?v=tq9UsrmkxTY&eurl** (*Story courtesy of Outer Limits column.*)

Ham Radio Suspended in Iraq

Iraq Amateur Radio Society (IARS) President Diya Sayah, YI1DZ, has informed hams worldwide that all Amateur Radio activity in Iraq has been suspended until the security situation there improves. Sayah said the suspension affects both Iraqi citizens as well as any foreigners – including military personnel and contractors – who have been on the air from Iraq identifying with YI9-prefix call signs. It does not affect the operation of Military Affiliate Radio System (MARS) stations, since they operate on military frequencies. Some modes like IRLP and EchoLink still are okay to use, as long as they don't involve transmitting a signal over the air.

Sayah told the American Radio Relay League that the government expressed concerns over the difficulty of identifying "enemy" as opposed to "friendly" radio traffic, the potential for revealing military movements via radio, and eavesdropping. Sayah has also asked the worldwide Amateur Radio community to use its influence to reverse the Iraqi government policy, which may reflect some misunderstanding of the role of amateur radio operators.

Dayton Hamvention

Don't miss the 56th show on May 18,19 & 20 at Hara Arena in Dayton, Ohio. The theme this year is: Local Clubs: The Heart of Ham Radio – to acknowledge the support that local ham radio clubs around the world provide to their communities and to amateur radio. For details, visit **www. hamvention.org**

Traditionally, the Hamvention® honors three amateur radio operators who have made significant contributions to the Amateur Radio Service. Recipients of this year's Hamvention awards are Jim Haynie, W5JBP, whose leadership of the Amateur Radio Relay League (ARRL) helped define amateur radio's role in emergency communication; Ed Hare, K4ZDH, whose technical documentation of BPL interference helped defend ham bands; and David Cameron, VE7LTD, whose efforts in developing the Internet Repeater Linking Project (IRLP) turned amateur radio repeaters into a worldwide communication network.

European DX Council

Shortwave listeners worldwide are cordially invited to the 2007 EDXC Conference, to be held November 1-4 in Lugano, Switzerland. Anticipated speakers include Bob Zanotti, Jeff White, Anker Petersen, and Torre Ekblom.

The venue will be the Hotel Dischma (make your own reservations at www.hotel-dischma.ch; phone +41 91 994 21 31) and discounted rooms for the conference are limited. Conference fee is Eur 95 per person, which includes seminars, banquet, a tour of Lugano and the local radio and TV station. For more information, please contact Mr. Tibor Szilagyi, Sweden (email: tiszi2035@yahoo. com; +46 8 500 264 83)

Storm Chasing
with
Amateur Radio

By Seth Price, N3MRA

Introduction

Forget what you see in the movies. There are no flying cows to dodge, no houses to drive through. Storm chasing is real. About the only thing we talk about dodging is boredom during the long van rides. Instead of fine dining, you might end up eating a convenience store burrito or some Pringles from the last stop. Hours are spent waiting, waiting, then rushing to the next town, many times with no storm to see. Most nights, you watch a sunset instead of a tornado. However, with a lot of skill, and a fair amount of luck, some afternoons are spectacular, and make it all worthwhile. Each year, storm chasers from local emergency groups, universities, Skywarn spotters, and tourists flock to Tornado Alley to get in on the action.

For many years now, there has been a partnership between Pulaski County High School in Virginia and Virginia Polytechnic Institute and State University (Virginia Tech). A meteorology class is taught to high school and college students to train them how to predict the how, why, when and where of severe weather. Once a student has completed this course, he or she is eligible for the ultimate in field meteorology study: a storm chase in the Great Plains.

After completing this course, I began chasing in 2003 with this group. Because I have been a licensed amateur radio operator since 1992, I brought along some radio equipment for the chase. I suppose the rest is history, as they say.

Before thinking that this is all fun and games, I will highlight the importance of amateur radio in emergency communications, including weather emergencies such as severe thunderstorms, flooding and tornadoes.

Skywarn

Skywarn is a volunteer group established by the National Weather Service (NWS) to track and report severe weather. They are the "ground truth" which confirm the forecasts and predictions from the NWS.

Meteorologists at the NWS make forecasts and predict where severe weather will strike. Without Skywarn, it becomes difficult to tell if there is just heavy rain or hail in a precipitation core. The exchange of information flows both ways. The NWS could see a hook echo on radar and then query the Skywarn spotters to see if there is a tornado. Sometimes it works this way; sometimes the Skywarn spotters see a tornado before a hook echo has been spotted on radar.

In general, Skywarn spotters are not storm chasers, they are public servants which observe the weather around them and report their findings. Storm chasers predict where the severe weather will strike, be there when it does, and report their find-

ings. While some Skywarn spotters are storm chasers, not all are. Being Skywarn trained does not make a storm chaser, and being a storm chaser does not mean Skywarn trained, though it should.

Amateur Radio

One method of communicating weather information is through amateur radio. In some ways, amateur radio is similar to CB, and while a full discussion of its similarities and differences is beyond the scope of this article, it will suffice to say that it is a hobby in itself and that Skywarn spotting is just one small part of what can be done with amateur radio.

While there are many available amateur radio bands (sets of wavelengths and corresponding frequency ranges), most Skywarn operations take place at the local scale, on VHF and UHF. For most Skywarn operations, two meter and seventy centimeter repeaters are used. Repeaters listen on one frequency and transmit on another, such that they can be placed in a position to take a signal and repeat it to extend the distance of the original transmitter. Many repeater sites have emergency power sources, so they are often used when the electricity has been knocked out.

Skywarn Nets

We have answered who and why of Skywarn communication, but we have not talked about the when and how.

What is considered severe weather? That is up to your NWS office, though some standard rules apply. Tornadoes are always considered severe weather. High winds, hail, flooding and winter weather are reportable as well. Lightning is never considered when issuing severe storm warnings.

How high is high wind? How much snow is considered too much? This is where your NWS must make the call. An inch of snow might completely paralyze Miami, whereas it would change absolutely nothing in Min-

Tornado in Furnas County, NE. This supercell later produced the Hallam, NE tornado, which was the widest tornado in recorded history. 5/22/04

Back-sheared anvil near Lexington, NE. We are looking at the back of the cell, and the back-sheared portion indicates a strong updraft, and thus a strong storm. 5/17/05

neapolis. The bottom line is that you must remain in contact with your NWS office long before the severe weather begins.

Now that there is a fuzzy definition of a severe weather event, we can outline what you need to do as a Skywarn spotter.

Watches, Warnings, and Severe Weather Outlooks

While the meteorology behind storm chasing is beyond the scope of this article, describing the products issued by the Storm Prediction Center (SPC) and NWS are important for the Skywarn Spotter.

There is always some confusion about watches, warnings and statements from the NWS. To understand what is happening, and to avoid causing undue panic, I will explain each of these.

Watches, such as tornado watches and severe storm watches, are issued when conditions are likely to deteriorate. Watches are issued to give the emergency management and local law enforcement a "heads up" as to what to expect. Normally, a watch box is issued long before there is any visible sign of severe weather, and is based on model runs and soundings from NWS weather balloons. A watch box is normally many miles in length, maybe as much as several states, and normally slopes from southwest to northeast. The issuance of a severe storm watch does not guarantee storms, nor does it mean the area outside of the watch box will remain storm-free.

Warnings are the severe form of watches. A tornado warning means there IS a tornado, take action immediately. A severe storm warning means that large hail, high winds, or heavy rains have been reported in the affected area. (Warnings are the equivalent of moving from

yellow alert to red alert, for you Trekkies out there.)

Warnings are much more localized. Most NWS offices still use a county based system of warning, where the affected counties are placed under a warning. This is convenient for NOAA radio and radio broadcasts. However, many sites are working on a polygon-based warning system. In this system, a polygon is placed in the path of the storm, which alerts more specific communities. To put it another way, think of a tornado moving northeast, right at the northeast corner of the county. Alerting the whole county places undo strain on the emergency services south and west of the storm. Polygon warning systems are much more convenient for the internet and television broadcasters, as this graphic can immediately be placed on the air. Warning a large county for a small, but severe storm can cause the NWS to sound like it is "crying wolf," and people will soon ignore the warning. However, the more visual polygon-based warnings are not as well suited to radio announcements. This can be a problem, as prime-time for tornadoes tends to be during the 5pm-6pm rush hour, when people are stuck in their cars listening to the radio.

Now that I have told you more about warnings than you wanted to know, I should also mention SPC Severe Weather Outlooks. The SPC evaluates a tremendous amount of model data, balloon soundings, and ground observations, and draws a graphic of what can be expected on any given day. The four categories are "no risk," "slight risk," "moderate risk," and "high risk."

Treat this as the NWS equivalent to the Smokey the Bear "Fire Danger" signs that you see along the highway or in parks. No risk means severe storms are unlikely. A slight
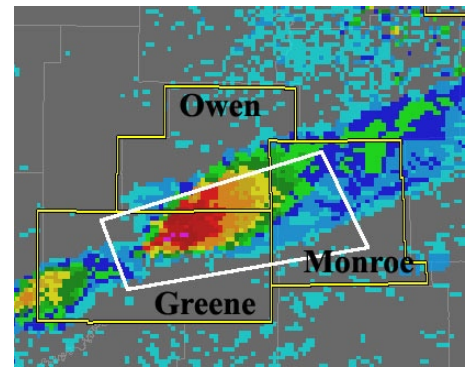
This is an example of the new polygon-based warning system under development by the NWS. In the county-based warning system, three whole counties would require warnings. Under the polygon based warning system, only the affected areas would be warned, which lowers stress and strain on emergency management personnel.

risk means that there are some signs pointing to severe weather in this area. Moderate risks encompass a smaller geographic area, but show an increased likelihood of severe weather in this area. High risks are the ones which emergency managers fear.

Using the word "risk" might be misleading for the storm chase community, as many of my best chase days have been on "slight risk" days, and many "high risk" days have been busted. High risks are often associated with passing frontal systems, which lead to severe lifting and squall lines – dangerous for the community, but very hard to chase due to their speed, size and lack of discrete cells.

A final note about watches, warnings, and Severe Weather Outlooks for the storm chaser. You cannot chase watches and warnings and

Unusual blue-green wall cloud. The blue-green color comes from a storm top of at least 48,000ft, and does not necessarily indicate hail or tornadoes, though storms that reach this height often produce severe weather. 5/24/05

expect to be successful. You can easily drive around in a watch box all day and not reach the affected area. Even warnings can be hard to chase – many times we have been in a warned county and have seen no severe weather!

How to Get Involved

While most days of storm chasing are spent in the car, not chasing storms, it is not a good idea to just jump into storm chasing without any experience. At best, you will be disappointed by the lack of storms you find without any meteorological training. At worst, you could be in the wrong place at the wrong time! Before storm chasing, I would recommend Skywarn training, as the absolute bare minimum. If possible, find someone in your area who is already involved with Skywarn and storm chasing. Learn the ropes before trying it out for yourself. You save yourself the frustration of many busted chase days!

Getting certified as a Skywarn spotter is free, only takes up a few hours, and is relatively easy. Get to know a few members of the local amateur radio club, check their website and check the local NWS website for training dates. Most groups offer a combination of courses: Basic and Advanced courses in the same night, or Basic, Advanced and Hurricane, or some other combination. Look for these nights in particular and attend the sessions.

Now that you are certified for Skywarn, getting into amateur radio is the next item on your "to do" list. The American Radio Relay League (ARRL) is the largest amateur radio organization in the country, and thus provides a series of books for learning to get your license. Getting licensed to transmit on the amateur radio frequencies is as simple as taking a multiple choice exam issued by the Federal

Developing cells on a flanking line in Yuma County, CO. A strong supercell creates a downdraft of rain-cooled air. The cold air forces the warmer air out of the way, which creates new areas of lift, and thus new storms form along this boundary. 5/24/05

Communications Commission (FCC) and administered at local amateur radio events.

There is some confusion as to which license classes exist and what is required for getting on the air. At the date of this publication, there are three license classes: Technician, General and Extra class, in order of increasing difficulty and thus license privileges. A technician class license will get you on the air and give you VHF/UHF privileges, which is to say the two meter and seventy centimeter amateur radio bands. Because these are the most used frequencies for Skywarn, many Skywarn spotters and storm chasers are technician class operators.

How about the tests themselves? Particularly for the technician class license, much of the test is dedicated to rules and regulations. There is no better way to do this than to memorize the answers to the questions. In truth, most amateurs might know the band plan for their favorite band, but they almost always have a total band plan chart to avoid having to memorize this. Websites, such as **QRZ.com**, have practice tests online which randomly select questions and tell you if you are correct, and after the appropriate number of questions, tell you if you passed the practice exam.

In addition to the website, I would recommend getting a beginner's book from the ARRL. There are many to choose from, and they provide the background that the website does not. Many people just use the website, and once they pass their exam, they say "great, now what?" If you have these beginner guides, they will tell you all the ins and outs of getting on the air and good operating practices.

Another way to get involved is to meet your local amateur radio club. Any active club will participate in contests and other operating activities where newer amateurs are often paired up with experienced ones to learn the ropes of radio. Some clubs even have a station set up so that you can use a few radios there and figure out what you like, without having to buy them all yourself!

In addition to learning how to use amateur radio, you will learn what emergency services are already in place. You don't have to be the lone ranger reporting the tornado; there might already be a highly sophisticated emergency communication system already running in your area.

Wall cloud near Maroa, IL. The peculiar thing about this is that it is spinning clockwise instead of the usual counterclockwise. 5/17/06

A Day in the Life of a Storm Chaser

If you want to chase storms, you must understand the meteorology behind the Severe Weather Outlooks and predict where you need to be to see storms. *This is the challenge!* You look at data collected early in the morning, and then at SPC's Severe Weather Outlooks for the day, and try to figure out where you need to be 10-12 hours later. A quick shower, mediocre continental breakfast at the hotel, and you are on the road.

If you were lucky with your end of the day analysis the night before, you might not have to drive so far, but if conditions changed overnight, you may be on the road through lunch. Or, if not, you might wish you were driving when you arrive at your predicted destination and play the waiting game for several hours.

In my case, I bring along an HF radio, a Yaesu FT-857D and talk to hams on 10, 15 or 20 meters. Some DXers try to talk to every county in the United States (a challenge called county hunting), and sometimes I end up in some sparsely populated counties and I make their day, as well as keeping myself entertained. Of course, while you are doing something to pass the time, you are constantly checking for updates on surface conditions. Often, the place with the best chance of severe weather may have shifted. It always helps to find a place with free wireless internet to download new data.

I once heard that one out of every nine storm chase days ends in a supercell, if you are an experienced crew and the weather gods are smiling upon you. So, we will say eight days end just as described above. For the ninth day, however, things get very intense!

You start to see some nice cumulus towers going up, and you drive to where they may be. You are constantly comparing the satellite view, your view, and an atlas to see how to get where you need to be.

You begin to see lightning, and hopefully have taken all the non-essential antennas off the roof of your vehicle! Using an *ARRL Repeater Directory*, you find the local repeater and listen for a Skywarn net. Normally, Skywarn operates on Stand-By mode before a storm, where a net control operator is waiting for severe weather reports. Someone sees large hail, or some other criteria outlined by the NWS serving the area. A local Skywarn net is called. You check in, report your position and your findings. Don't exaggerate! If you do not see anything, then you have nothing to report!

While you monitor the radio, someone else is looking at radar images and comparing those to a map. Avoiding large hail and tornadoes is the key to any successful storm chase! Even one large hailstone can ruin a windshield and leave you sitting on the sidelines for a few days. The driver of the crew gets his directions from the map/radar people, and your team dodges the hail and tornadoes, while trying to keep up with the storm.

Finally, after dark (NEVER chase after dark), you stop again and look at the Day 2 SPC Severe Weather Outlooks. The storms might be over for the chase team, but the day may still not be finished. It could be a twelve hour drive to tomorrow's destination, and the more driving done tonight, the less tomorrow. Driving four hours after dark is not uncommon. Dinner may or may not happen. You welcome the opportunity to go to bed, when you will wake up and do it over again tomorrow.

Conclusion

Now that you've read some background information, get involved! Take a Skywarn class from the NWS, practice for your amateur radio exams, spend some time learning how emergency communication systems work.

Overall, I hope that you give Skywarn, amateur radio, and storm
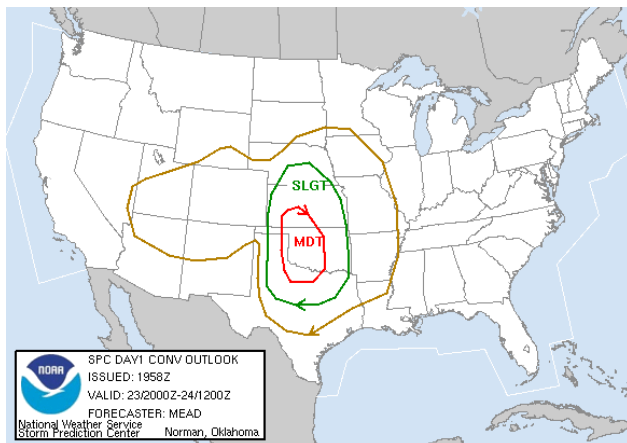
A trip to the Storm Prediction Center (SPC) homepage will show graphics like this one. The day for which this was issued, there were several tornado reports across Texas and Kansas, and damaging wind and hail across Texas, Oklahoma and Kansas.

chasing a try. It has been quite enjoyable for me, and I hope that I have left you with enough information to get started.

WEBSITES OF INTEREST:

www.weather.gov - National Weather Service
www.spc.noaa.gov - Storm Prediction Center
www.qrz.com - Practice Tests
www.arrl.org - American Radio Relay League

A "Sheriff-nado" as they are called. While this looks similar to a tornado, it is not. The dust is actually being kicked up from the storm's outflow, and close inspection will reveal that the "funnel" is not ragged and not rotating. This was incorrectly called in as a tornado. 5/23/06.

New Heights for Amateur Radio

By Bill Brown, WB8ELK

Bill Brown WB8ELK launches the HiBall-10 high altitude balloon. Gary Dion N4TXI to the right. (Photo by Vicky Wilson KE4JQX)

A number of groups around the world have been taking Amateur Radio to new heights. Carried aloft by weather balloons, these radio experiments fly to stratospheric altitudes (over 100,000 feet) into a region called Near Space.

There is now enough activity by the Amateur Radio High Altitude Balloon (ARHAB) community that you can listen in with your radio just about every weekend and often during weekdays as well. The experiments range from radio beacons, GPS location packets (APRS), radio repeater relays, WiFi links as well as live TV transmissions.

Why fly on a balloon? The answer is quite simply that radio line of sight range increases dramatically with height; something you can experience by taking a radio to a mountaintop or up in a plane. From a balloon's lofty perch at 100,000 feet, it can literally transmit nearly 400 miles in all directions with very low power. I've flown a 50 milliwatt transmitter on the VHF bands and it has been heard by ground stations over a 12-state region. On the ground this same transmitter is lucky to get out a mile or two.

Quite often, universities will fly experiments to collect atmospheric data and these sometimes will have amateur radio experiments onboard as well. Our local university's engineering department in Huntsville, Alabama, (UAH) has a senior electrical engineering class where they design and build an experiment (dubbed a BalloonSat) and then fly it into the stratosphere. They are actually building a satellite payload and flying it into an environment that is quite literally the edge of space – all in a relatively short mission that costs hundreds of dollars instead of millions.

Typical Flight

A typical balloon flight consists of a latex weather balloon (think party balloon on steroids) plus a parachute with the experiment dangling at the bottom (*see Photo 1*). The following website link shows a video and some more photos of my most recent launch:

www.wb8elk.com/hiball10.htm

Up to twelve pounds can be flown by just filing a NOTAM with the Federal Aviation Administration (no more than 6 pounds in any payload). Most groups adhere to this rule, but some of the larger groups, universities and government agencies do fly much larger experiments which require a waiver from the FAA.

The usual ARHAB mission takes about 90 minutes to reach 100,000 feet. At that point the balloon has expanded to its maximum size due to the near vacuum environment and

Edwin Flowers KG4LVO and Marty Clark KG4WPV recover the payload from the mountaintop near Peachtree, NC (Photo by Dewhitt Sharp)
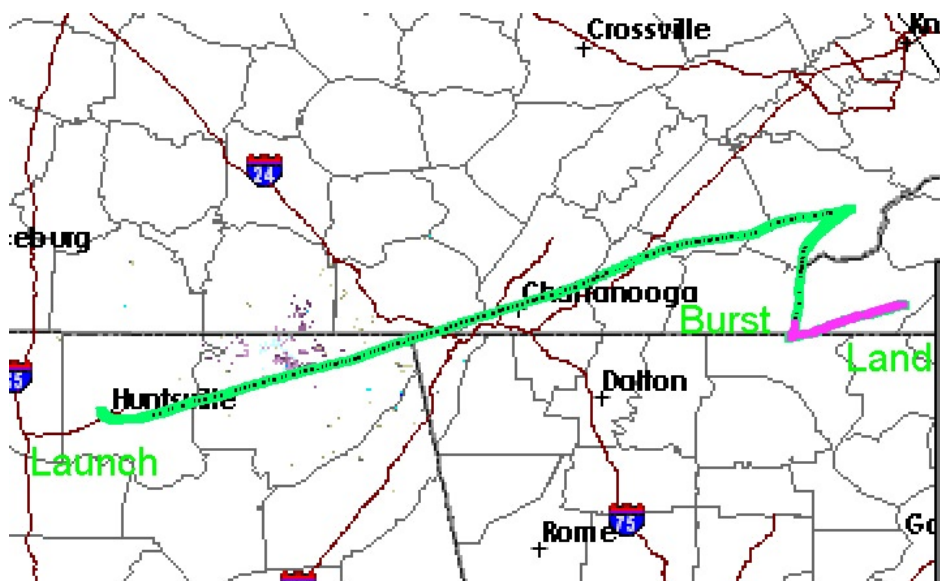
Full Flight path of HiBall-10 (landing in Peachtree, NC near Murphy)

bursts. I have seen recordings of this event from live TV downlinks and it's quite spectacular. The parachute inflates and brings the experiment down to a gentle landing some distance away from the launch site, usually taking about 40 minutes. Fortunately, we have prediction software now that allows us to use the FAA winds aloft data to help us forecast the landing zone fairly precisely.

Part of the fun is chasing the balloon and recovering the payload. There are a number of amateur radio operators who will jump at the chance to tromp through the woods or across fields to find these experiments. For example, in a recent flight attempt for a record time aloft, I launched a balloon from Huntsville which flew over 150 miles downrange to land about a mile or so from *Monitoring Times* headquarters in Brasstown, North Carolina!

Although it was transmitting a radio signal, the GPS unit had failed a few thousand feet before it landed, so I didn't know exactly where it had come down. One of our balloon trackers, Eddie Foust WD4JEM, called his dad Jim Foust K4AIH who lives in the area, and sure enough he could hear the signal. Eddie then contacted *Monitoring Times* publisher Bob Grove W8JHD who could hear it from his house and headed out in the morning to pin down the landing site near a mountaintop. On the other side of the mountain, Edwin Flowers KG4LVO and Marty Clark KG4WPV from Andrews, NC, homed in on the signal using nothing but their handheld radios checking for maximum signal strength. They found it 50 feet up in a tree right on top of the mountain peak and recovered it.

Listening In

There's a website where you can find launch announcements for most ARHAB flights: **www.arhab.org**

There you will find time, location and frequencies that will be used. Just find a launch within 400 miles of your location and tune in, although some flights carry HF transmitters that can be heard thousands of miles away. If you click on the callsign of a balloon flight announcement on the ARHAB page, it will direct you to **FindU.com**. This is a wonderful website that links amateur radio GPS APRS packets into the internet and displays their location on a map in real-time.

You'll hear GPS packet data (APRS), Morse Code, or recorded voice beacons and live television. In addition, when a repeater relay experiment is onboard, you can listen in on live conversations between mission control and ground stations hundreds of miles away using the balloon as a Near Space satellite.

As an example of one recent flight, I had GPS position data transmitting on 144.39 MHz FM, a simplex voice repeater relay on 144.34 MHz FM, and live TV camera downlink on 439.25 MHz (cable ready TV channel 60).

If you'd like to watch a launch or join in on the recovery hunt, find the nearest group on the ARHAB links page and join in on the fun. If you'd like an opportunity to listen in on almost a dozen balloons launched at once, every summer a conference is held in the Great Plains called the Great Plains Superlaunch: **www.superlaunch.org** .

Government Balloons

For those who want a real monitoring challenge, the Weather Bureau launches radiosondes to calculate their winds aloft forecasts twice daily (0000 and 1200 UTC) from sites across the US and the world. These transmit on 1.680 GHz but can drift from 1.675 to 1.685 GHz (WFM). You'll hear a series of high-pitched tones which indicate temperature, pressure and humidity. I've tracked these using a small directional antenna and either an AOR AR-3000A or an ICOM R-3 in Wideband FM mode. They are fun to chase and recover, but a real challenge due to the frequency drift.

Another balloon is called the Ozonesonde. There is a site in Huntsville that launches every Saturday around 1800 UTC. As the name implies, it measures ozone in the atmosphere and transmits around 402.5 MHz (WFM mode). The frequency on this type of balloon can drift from 401 to 404 MHz. It transmits via 300 baud ASCII and sounds like high- speed RTTY signals. These are great fun to track down; they even offer a reward for their return to help pay your gas. There are a few other sites that launch these in the US: Boulder, Colorado (every Friday around 1800 UTC) and also upstate New York.

Keep Looking Up

This is an opportunity for anyone with a radio to participate in a low-cost space program. It's always a thrill to participate in a Near Space balloon flight and widen your monitoring horizons.

Bill Brown (WB8ELK@gmail.com) works as an Electrical Engineer and is one of the founders of High Altitude Research Corporation in Huntsville, AL. He has been flying Near Space balloons for 20 years.

Exploring the World of 10 Meter Beacons

By Ken Reitz KS4ZR

Tune through the 10 meter band almost any time of day, any day of the week during the doldrums of this sunspot cycle and you'll come to one conclusion: The band is dead! Now tune from 28.200 to 28.300 MHz and you'll hear something very interesting: low power beacons sending out their endless messages and giving you vital information on the real status of the band.

Beacon Rules

Ten meter beacons are used to study propagation in the atmosphere and help indicate the Maximum Usable Frequency (MUF) for the HF bands. The Federal Communications Commission makes a special note of beacon operations in FCC Rules part 97.203. Here are the basics: 1) Any amateur holding a technician level license or higher may operate a beacon station. 2) You can't operate on more than one channel in the

This QSL is from IY4M the beacon/robot from the Associazioni Radioamatori Italiani commemorating Guglielmo Marconi's beginning of radio in Bologna, Italy. (Courtesy: Associazioni Radioamatori Italiani)

same band from the same station location. 3) Transmitted power must be less than 100 watts. 4) The specified band segment for 10 meters is 28.200-28.300 MHz. 5) A beacon may transmit one-way communications. There are a few other items covering setting up a beacon in the "national quiet zone" around the National Radio Astronomy Observatory in West Virginia and at Arecibo in Puerto Rico.

While FCC rules confine U.S. amateur beacon operations from 28.2-28.3 MHz, other countries make beacon frequencies available much lower. In fact, there are some 48 international beacons operating from 28.115 to 28.200MHz transmitting from Europe, the Mideast, South America, Canada, Japan, and West Africa (see International Beacon Chart).

Beacon Construction & Operation

The FCC leaves the 10 meter beacon band open to operating almost any kind of transmitter (as long as the basic rules are obeyed). That's the fun side of the band. The result is that there are almost no two beacons alike. Dozens of approaches to building and operating these beacons can be found. What beacon operators are looking for in a transmitter is low power output, easy construction, and tough as a brick. These rigs have to endure 24/7 operating conditions year 'round. They have to take driving rain, lightning, ice storms, searing summer heat and still keep going. You might think this means that only MilSpec radios would be capable of this sort of duty. But, that's not the case.

Many beacon operators use old CB radios converted to operate in the 10 meter band. These rigs are further modified so that the transmissions use one side-band of the original AM signal to send CW via a microchip. Some operators use home-brew CW QRP (low power) transmitters, others use older low power 10 meter ham rigs such as the Radio Shack HTX-100 and the Uniden HR2510. Most use simple vertical antennas, often not more than 10 or 20 feet off the ground.

There is an unofficial list of current 10 meter beacons kept up to date by Bill Hays, WJ5O

(**www.qsl.net/wj5o/bcn.htm**). Check out his own home page (**http://home.stx.rr.com/wj5o**) and you'll find tons of tips for 10 meter DXers, as well as quite a few ideas about building your own 10 meter beacon. You can also tune in to the 10 meter beacon operator calling frequency at the top of the hour on 28.327 MHz and see what's happening. Listen for Bill's own beacon on 28.289 MHz.

There is also a "beacon reflector," which is an automatic e-mail service that delivers the latest reception reports from contributors to the reflector from around the world. To join, send an e-mail to *hfbeacons@explore.plus.com* and in the subject write: subscribe. Then sit back and wait; you'll get tons of beacon reports and conversations about beacons from some of the world's top 10 meter beacon band monitors.

Sampling the 10 Meter Beacons

Last summer I spent a few weeks monitoring the 10 meter beacon band and was amazed to log dozens of stations throughout the period, despite generally dismal HF conditions. This seeming contradiction is the main thing that keeps beacon listeners tuned in. I sent reception reports via e-mail to a number of operators and received some great QSLs and a lot of information about these stations and their operators. I asked each to describe his or her beacon station, how long it had been in operation, how many signal reports they receive each week, and where they come from. Here's a round-up of a few of the beacon operators' replies:

Ron Anderson KA0PSE/B
(28.218.5) Duluth, MN

"The rig is a home-brew right out of *QST* magazine, March 2000, with a couple of modifications, mainly a little CPU fan to cool the finals. It puts out a faithful 3.85 watts into an AR-10 vertical antenna at about 40 feet on the roof of my work QTH (WDSE-TV Public Broadcast Studio). The rig was fun to build and I think it sounds pretty good ... The beacon has been on the air since December 1, 2001. When the band is up ... I have received reports from California
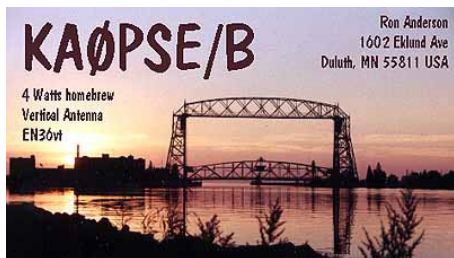
QSL card from Ron Anderson KA0PSE/B runs 4 watts from a home-brew into a AR-10 vertical at 40' from his workplace at WDSE-TV Public TV Broadcast Studio in Duluth, MN. (Courtesy: Ron Anderson KA0PSE)

to Germany to Uruguay to South Africa and Australia, usually about 6 per month."

Domenic Bianco KC9GNK/B
(28.2836) Madison, WI

For two years Domenic ran a 10 watt beacon using an attic mounted antenna and received 1-3 reports per week. Then he reconfigured the beacon to use an Icom 718 feeding a Ringo AR10 antenna on a 43 foot tower (see QSL photo). The extra power nets an amazing 5-10 signal reports a day from beacon monitors. Domenic's new beacon, on the air for just a year, is the easiest catch on the band. He uses a Logikey K-5 keyer to run the beacon.
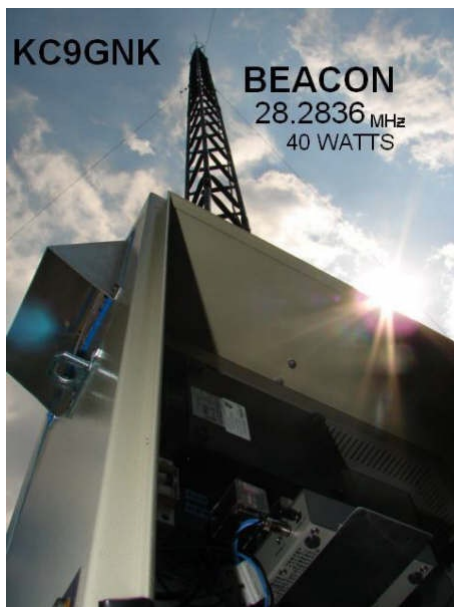
Domenic Bianco KC9GNK/B sends this QSL for received reports. His 40 watts is the easiest catch on the band. Let him know what you are using to tune in. (Courtesy: KC9GNK)

Bruce Burkeen KM4GS/B
(28.292.5) Gainesville, KY

Bruce's beacon is celebrating 20 years on the air: "I started the beacon in 1987 using a ... CB rig and a Commodore VIC20 that keyed a relay to send CW. It worked pretty well for several years 'til the relays were worn out (a relay has to make a lot of cycles to send CW 24/7). In those days it was 100% solar powered to a ground mounted Antron 99 CB antenna.

"I have switched my beacon transmitter to a Kenwood TS-130 feeding a Hustler 4BTV

Bruce Burkeen's KM4GS/B beacon is in here among his other ham gear and is currently running 4 watts output into a Hustler 4BTV antenna mounted on a barn roof. (Courtesy: Bruce Burkeen)

vertical mounted in the center of a 72 foot long metal barn roof. The controller is a ComSpec ID-8 board in a metal Bud box on top of the radio. As for reports ... I get 4 or 5 a week. Most everything is in the 400-500 mile range ... When the cycle is at its peak the reports will run 25-50 per week with VK's (Australia) and ZL's (New Zealand) sending most of the DX reports."

Ronnie Casey K4JDR/B
(28.298) Raleigh, NC

Ronnie uses a Uniden HR2510 10 meter rig in CW mode controlled by a ComSpec ID-8 and feeding a Solarcon A99 cut to the frequency and mounted at 26-ft. He notes that there are a number of shortwave listeners who send QSL reports to him. His beacon has been on the air continuously since 1998.

Ronnie Casey's K4JDR beacon uses a Uniden 2510 10 meter rig and has been in operation 24/7 since 1998. (Courtesy: Ronnie Casey K4JDR)

Les Ellis WB0FTL/B (28.217)
Alden, MN

Les has been a loyal subscriber to *Monitoring Times* since day one and says he still has every issue! He uses a Radio Shack HTX-100 10 meter transceiver in the 5 watt output CW mode. He uses a Power-One HE15-9 power supply and an Embedded Research TiCK CMOS keyer for a controller. His antenna is an AR-10 vertical at 25-ft above ground.

Allan Gallo W0ERE/B (28.2828)
Hillandville, MO

Allan's beacon hit the air in May 1996, also using a Radio Shack HTX-100 ten meter rig (which is a testimony to that old rig!) run-

ning 5 watts into a 1966 Supermag antenna from Antenna Specialists. He uses an Autek Research MK-1 controller to send CW. Allan reports that he hasn't received a DX report in 6 years but received many during the peak of the last solar cycle.

Bill Hays WJ5O/B (28.289 MHz)
Corpus Christi, TX

The aforementioned Bill Hays has operated his beacon since 1992. His original converted CB rig lasted 11 years and was replaced with another which still runs 3 watts into a home-brew vertical on top of his roof. He uses a PIC based 12F629 keyer to run the beacon.

Bill Hays sends this QSL for reports of his WJ5O/B. Even with just 2 watts into a roof mounted vertical he still gets DX reports even at the bottom of the solar cycle. Ten is alive! (Courtesy: Bill Hays WJ5O)

SWLers Test Your Gear

The 10 meter band presents an excellent opportunity for SWLers to test their radio and antenna set-up. A number of automated beacons are situated throughout the U.S. and the world which lets you see how good your system is and just how good or bad band conditions are. Check out the following four automated 10 meter systems.

The PropNet Project

PropNet uses the digital format known as PSK31 for transmitting and receiving signals on a specific frequency on 10 meters. Their motto is : "If the band is open and nobody is transmitting, can anybody hear it?" Here's how the PropNet project works: "Participants, known as Probes, will periodically transmit on an *anchor* frequency [on 10 meters its 28.131 MHz]. Any station that receives that transmission forwards the 'catch' to an Internet server that plots the event on a map hosted at findU [the Automatic Position Reporting System (APRS) database access site]. While an amateur radio license is required in order to be a transmitting participant, unlicensed individuals are encouraged to participate as receive-only stations reporting what they capture."

You can get more information and see the latest "catches" on propNet at **www.propnet. org**.

The 250 Synchronized Propagation Beacon Project

Begun in May 2005, the 250 Synchronized Propagation Beacon Project is a work in prog-

ress. According to their web site (**www.wb4wor. net/sync**) the project was started "...by several 10 meter beacon operators in an ad-hoc fashion to experiment with operating 10 meter beacons, similar in concept to the IARU beacon project on the other amateur HF bands to help with the crowding of recent years in the 10 meter beacon band."

The project uses 28.250 MHz, hence the name, and is run by WB4WOR, a club station of which Charles Layno, W4CL of Greensboro, NC, is trustee. The idea is to have a set list of stations at various locations in the U.S. automatically transmitting for 10 seconds each at decreasing power levels starting out at 20 watts going to 2 watts, 200 mw and finally 20 mw. What you can and cannot hear tells you everything you need to know about where propagation on 10 meters is happening. Check out their frequency, and for more developments keep checking out their web site for updates.

IY4M Robot

The first amateur radio robot beacon, IY4M, operates on 28.195 MHz. Known as the Guglielmo Marconi Memorial Beacon Robot, IY4M is located in Bologna, Italy. QSLs are handled by IK4UPU. To celebrate the 100th anniversary of Marconi's revolutionary radio activities from Bologna, the Associazioni Radioamatori Italiani redesigned the IY4M robot for automatic transmission of beacon information every 30 seconds and then stands by for automatic QSO mode in which the robot station will engage in two way exchange of information in CW from 10 to 60 wpm.

For detailed information about how to do a QSO with IY4M go here: **www.ari-bo.it/ iy4me_2.htm.** The robot will send you all kinds of information including your signal report and current weather conditions at the IY4M location. When the solar cycle improves this will be a great frequency to monitor.

NCDX/IARU 28.200 Beacons

The Northern California DX Foundation in conjunction with the International Amateur Radio Union (IARU) have established a system of 18 beacons around the world (see list below) all operating on 28.200 MHz. To ensure that propagation tests are equal, each NCDX beacon station is identical. They use standard HF ham transceivers and antennas. The controller, which times the transmissions and steps the power output up and down, was devised by Bob Fabry, N6EK, who uses an Intel 8748 microprocessor in the controller. Details and schematics are found on the NCDX web site (**www.ncdxf.org/Beacon/ BeaconController.html**).

Here's how the 28.200 beacon system works (from the NCDXF page): "...Each beacon transmits every three minutes night and day...A transmission consists of the call sign of the beacon sent at 22 wpm followed by four one-second dashes. The call sign and the first dash are sent at 100 watts. The remaining dashes are sent at 10 watts, 1 watt and 100 milliwatts."

DIY 10 Meter Beacon

As with many other aspects of amateur radio, the 10 meter beacon band is a niche with ardent devotees. It presents a great opportunity for experimenters, home-brewers, and SWLers alike. And, as with so many other aspects of this hobby, opinions are divided. Some fear that there are too many beacons on the band. Others believe you can't have too many. My own feeling after monitoring the beacon band for quite some time is that as long as operators stick to the "gentleman's agreement" regarding beacon operating on 10 meters it will be a useful resource for a long time to come.

If you decide to start your own 10 meter beacon operation, here are some tips: When you pick an operating frequency, check with the WJ5O list and try to avoid being on top of an existing station. Be able to monitor your transmission to insure that it's functioning properly. Keep the transmission output as low as possible. If every beacon on the band is operating at under 5 watts there'll never be a problem with overcrowding. According to the WJ5O list, very few stations operate over 10 watts with many in the mW range.

When planning your beacon, you may want to isolate the transmitter and antenna from your main radio operations and antenna location to avoid interfering with yourself. And, finally, make sure your beacon is operating 24/7. There's little point in a beacon which is on intermittently. The exception is when you're 100% direct solar power and the power is only up when the sun is up.

Monitoring the Beacon Band

I've used a variety of receivers to listen to the 10 meter beacon band. Any receiver with SSB/ CW capability will work. I've used a number of portables with only the built-in telescoping whip antenna and had excellent results. I've used my ham rig with a beam antenna and, not surprisingly, was able to copy beacon stations which were much weaker with an omni-directional antenna. Still, you don't need much of a signal to receive these little workhorses.

Most beacons use a programmable microchip to send their message in an unending loop of CW typically at 10 or 15 wpm. Many start the loop with a series of three attention getting V's. This is typically followed by the letters "de" (Morse code for "from") and the call sign of the station which adds /B to the suffix to indicate it's a beacon. Even if you don't know Morse code, you can copy the station call signs, because they are repeated over and over. Concentrate on getting one letter at a time. If you can only copy the first letter or two and the number in the call, you have all you need to determine what station you're receiving. For example, if I copy W0 and my receiver shows I'm tuned to 28.282 then I check out the WJ5O list and see I'm copying W0ERE/B, Highlandville, MO, which is running 5 watts into a vertical antenna. It's just that simple!

You can QSL beacon stations either via e-mail or via postal mail. Some stations will send their e-mail address as part of the transmission. If not, simply go to **www.qrz.com** and look up the call sign. Then click on the place where it is indicated for the e-mail address. To receive a paper QSL card, use the mailing address at the same web site and don't forget to include an SASE. As indicated above, some beacon operators receive many QSL requests per month and at $.39 each, the postage can add up.

In your report, use the RST reporting method, where R= Readability (on a scale of 1-5), S=Signal Strength (on a scale of 1-9) and T=Tone (also on a 1-9 scale). A great signal report would be 599; a weak signal report would be 519; and a poor signal report would be 419. On your report list the day, time, year, frequency and RST along with a run-down on your receiving equipment and your location.

The 10 meter band is a slave to the sun. When the ionosphere is energized there'll be propagation. After the sun goes down, propagation will be limited to ground wave, typically 5-10 miles. At sundown you can "ride the terminator" (the line between those areas lit by the sun and those not) for some interesting DX.

Beacon monitoring is a year 'round activity. In the winter months you may hear more DX stations and in the summer you'll generally hear more stations within a 500 mile radius. But, sometimes, without any warning the band will open up and you'll get some really great catches. As the new solar cycle builds, you'll hear more and more beacons throughout the day. The more you listen to the 10 meter beacons the more intrigued you'll be with the whole subject of propagation.

If you're a ham and you see the band is open why not just move up the band to the SSB segment or down to 28.120 (the BPSK31 segment) or the bottom of the band where the CW ops lurk, or 28.680 (the SSTV calling frequency) or 29.600 (the FM calling frequency) on this multi-faceted band and get a QSO going? You know the band is open!

LOG THE INTERNATIONAL 10 METER BEACONS

You can log nearly 50 DXCC countries and at least 40 states by just listening to the 10 meter beacon band. Check out the unofficial 10 Meter Beacon List at **www.qsl.net/wj5o/ ben.htm** for the current list. Here's the official NCDXF/IARU list:

NCDXF/IARU INTERNATIONAL BEACON PROJECT
(All stations transmit on 28.200MHz)

4U1U	United Nations, NYC
VE8AT	Nunavut, Canada
W6WX	San Jose, CA
KH6WO	Laie, Oahu, HI
ZL6B	Masterton, New Zealand
VK6RBP	Rolystone, Australia
JA2IGY	Mt. Asama, Japan
RR9O	Novosibirsk, Russia
VR2B	Hong Kong, China
4S7B	Columbo, Sri Lanka
ZS6DN	Pretoria, South Africa
5Z4B	Kiambu Kenya, Africa
4X6TU	Tel Aviv, Israel
OH2B	Karkkila, Finland
CS3B	Medeira Island
LU4AA	Buenos Aires, Argentina
OA4B	Lima, Peru
YV5B	Caracas, Venezuela

OTHER RESOURCES:
Gunter DF4PV, has a weathercam on DM0ING on 28.213 has created a map of Europe with the 10 meter beacons here: http://freenet-homepage.de/df4pv10/Baken.jpg

Enrico, IW3FZQ has updated beacon audio files on his web page. http://www.qsl.net/iw3fzq

Rodney, AC6V has an extensive beacon page at http://www.ac6v.com/beacons.htm

The Electronic Industry Goes Green

By Gregory L. Smith

Good News for the Environment

Tin/lead solder in electronics is going the way Freon® (Chlorofluorocarbon) did ten years ago. Freon products used to be used for cleaning flux off of circuit boards after the soldering process. Chlorofluorocarbons are now infamous for greatly adding to the depletion of the earth's ozone shield.

Have you ever wondered where your old IBM Personal Computer and all the other models that became technologically obsolete landed up? How about all the other electronic products: radios, TV's, VCR's, printers, scanners and endless electronic gadgets? Even with expensive radios, it is often less expensive to scrap a pc board than to troubleshoot and repair a problematic circuit. In most cases, the printed circuit boards are not recycled or parts reclaimed. In printed circuit boards, the metal that is of most concern is lead. Lead is used on pc board traces, component leads, and in solder.

Hazardous electronic product waste has become a global environmental concern. After electronic products reach the end of their useful life they need to be disposed of. Reclaiming metals and plastics is a costly operation; the most cost-effective disposal method is to simply send scrap electronics to a landfill. However, this creates a problem, because hazardous materials can leach into the ground, contaminating both soil and water.

European and Asian countries have addressed this concern by eliminating hazardous materials in manufacturing electronic products. Materials that are of concern are lead, cadmium, hexavalent chromium, mercury and PBB/PBDE (flame retardants).

The effort to remove lead from electronic products, along with other hazardous waste, can only help our environment. However, lead-free technology will affect each of us as consumers of electronic products.

Japan Leads the Way

Over the last several years, major electronic industries in Japan and JEITA (Japan Electronics and Information Technology Industries Association) have been researching alternatives to tin-lead solder. Tin-lead solder has been used for decades with outstanding, proven reliability. Finding a substitute solder was not an easy task, since other alloys had many unacceptable characteristics, such as higher melting points and poorer joint quality. As acceptable alternative alloys were discovered, companies quickly patented the alloy for their exclusive use in electronic products.

Japanese companies realized that changing over to lead-free products would be an important step for homeland ecology, since Japan has such a small land mass. Also, the Japanese consumer wants the latest electronic technology, which means a shorter product life and a greater number of products to be recycled.

A second reason for going lead-free was to provide a marketing edge for exported products. It is interesting to note that this effort was done on a volunteer basis. The now predominant Sn96.5Ag3.0Cu0.5 (Tin/Silver/Copper) alloy is used in Japan wherever special patented solder is not utilized. This alloy usage is increasing elsewhere in the world as well.

The European Union took a different approach to this situation by introducing legislation in the form of directives that would phase out leaded solder, beginning July 1, 2006. These directives are known as the WEEE (Waste from Electrical Equipment) and RoHS (Restriction of Hazardous Substance). The European Commission has estimated that to make products compliant to both RoHS and WEEE Directives will increase the cost between 1 to 4 percent.

American Companies Stall

American companies, on the other hand, were not interested in going over to lead-free solder products. Their salient arguments against going to lead-free solder were poor reliability and added cost. Lastly, end of product life disposal did not pose a major issue in the U.S. The domestic mindset was that the industry was staying with tin-lead.

Meanwhile, however, the Environmental Protection Agency (EPA) had a real concern with the disposal of hazardous waste, including materials used in electronic manufacturing. The EPA requested that U.S. manufacturers eliminate or limit the use of these hazardous materials, lead, cadmium, hexavalent chromium, mercury and PBB/PBDE.

With global markets legislating that products must be lead-free, this became an import requirement, and American corporations went into overdrive. At the 11th hour, they found it exceedingly difficult to find a solder alloy that would give results equal to tin-lead. Japanese patents on successful soldering alloys made the job of finding a cost-effective solution even more difficult.

Globally, 100 lead-free alloy configurations have been considered; however, after all the research and testing only a dozen or so are being used. Global agreement has generally been achieved on tin-silver-copper and tin-copper alloys, mostly for wave solder applications. SAC305 (tin-silver-copper) is the solder acronym you will see most often.

Always Exceptions

In electronics and associated hardware applications where high reliability is a necessity, tin-lead solder is still required. These critical applications are aerospace, military and medical electronics. The RoHS directive has provided exemptions for industries that require high reliability and wide temperature operation. These exemptions are known as RoHS5 and RoHS6.

In addition, one of the largest domestic telecommunications companies has stated, for reliability reasons, that all network hardware will specify the tin-lead solder fabrication. The telecom industry requires 99.999% reliability on their equipment. On the other hand, this same company will market and sell cell phones manufactured with lead-free solder because of their typical 2 year life cycle.

Engineering Challenges

Lead-free soldering brought many manufacturing and engineering challenges. One of the most interesting problems was the growth of tin whiskers. These are conductive filament or needlelike structures that begin growing

Needle-like

50μm
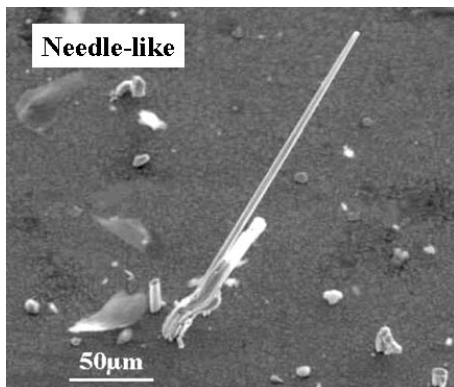
after a product is manufactured. Any soldered component that has a mechanical stress point would be subject to tin whiskers.

Sometimes, there is enough potential and current capacity to burn open the shorted circuit path. Another possible result of whiskers is an intermittent short that causes a circuit problem one moment and is gone when an attempt is made to troubleshoot.

A tin whisker starts as a single tin crystal, typically only a few micrometers in diameter. Tin whiskers can grow to a length of 10 millimeters; however, 1 millimeter length is most common. This problem can show up in passive components, such as ceramic capacitors, resistors, sealed relays and sealed hybrid circuits, printed circuit boards and – tragically – in pacemakers.

In the case of the pacemaker, the manufacturer specified a tin-lead crystal assembly. The crystal manufacturer supplied the manufacturer a lead-free part. The crystal shorted out, due to a tin whisker, and the pacemaker no longer functioned. This event alone brought serious attention to lead-free solder technology.

NASA Goddard Space Flight Center, NASA Electronic Parts and Packaging (NEPP) Program and the Center for Advanced Life Cycle Engineering (CALCE) at the Univer-

sity of Maryland, along with other military contracting companies, did many studies on tin whiskers. The bottom line was that whisker growth could be minimized but not eliminated. The overall recommendation was to eliminate mechanical stress on components when soldering and use a conformal coating on printed circuit board surfaces after assembly. Other problems were identified as well.
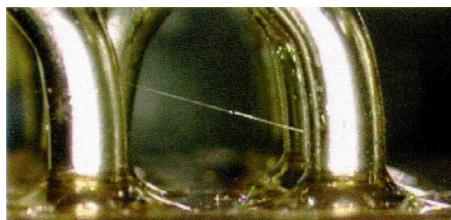
The electronics industry is continuously reducing the size of electronic components. Microprocessors and other large scale integration devices have miniscule lead pitch, pin to pin. This situation exacerbates the whisker problem and makes circuits less reliable. Vibration and handling have been known to shed whiskers onto other circuitry.

The following is a quote from CALCE: "Whisker growing in fielded product represents a potential failure time bomb." Texas Instruments is using Nickel/Palladium/Gold on their device pins to avoid the whisker problem.

"Popcorning" reaction is another effect caused by the higher solder temperature. If an encapsulated component contains moisture, as the solder temperatures exceeds 100 degrees C, the moisture within the molded part will become a gas. If this high pressure gas cannot find a path to escape, it tends to pop the molding compound like popcorn.

Higher solder melting temperatures are required for lead-free alloy solders. Typical melting points for tin-copper are 227 degrees C and for tin-silver, 221 C. With higher soldering temperatures, soldering has to be done within a

shorter period of time or the part will be damaged. Part removal at this higher temperature will damage the part in most cases.

Plastic component cases are especially prone to damage, as well. This means that soldering processes have to be redesigned as well as new soldering equipment. Even fixed-temperature hand-soldering irons will not be suitable for this type of solder.

One very important characteristic of tin-lead solder joints is that they are accepting of wide variations in temperature. All components and circuit boards contract and expand with temperature. Each material has its own mechanical expansion co-efficient, which means that if the solder does not stretch or contract to neutralize this dimensional change, the component or solder joint can crack. Most lead-free solders lack this characteristic.

There is also an inspection dilemma: If you visually compare a lead-free joint to a tin-lead solder joint it will look grainy and dull. Leaded solder joints of similar appearance would likely fail a visual quality control inspection. This aspect of lead-free soldering poses a challenge to the electronic industry to identify bad assemblies.

The flux chemistries that worked well with a leaded process are not the best fit for lead-free soldering. Fortunately, most hand soldering applications require the use of wire solder. Manufacturers, such as Kester, incorporate a flux core(s) with the applicable chemistry compatible with the lead-free solder.

For the Hobbyist

How will the changeover to lead-free solder affect the radio hobbyist? You will still be able to buy tin-lead solder as you have in the past for electronics usage. There is no legislation preventing you from using this solder. However, electronic distributors such as Digikey are depleting inventory of parts with tin-lead solder dipped or plated leads.

In most cases, soldering will be slightly different than it was with its tin-lead predecessor. When soldering components to a pc board, you will notice that the lead-free solder does not spread out as did tin-lead solder. Also, it takes a longer time to melt lead-free solder in making a joint. Soldering parts that are RoHS compliant (lead-free) with leaded solder will not cause a joint problem. If you would like to use a lead free solder, a tin-copper alloy would be a good choice.

Get Set for Product Failure?

This author wonders how product reliability will be with consumer products such as large screen TVs and high end radios. With many of these products selling for more than $1000, it would be painful experience to replace one of these items after its warranty expires.

Solid state technology has given the consumer outstanding product life to date, even considering increasingly complex electronic circuits. The industry reports the average life of current consumer electronics products to be 3 years. More than 10 percent fail within a 2

Crystal
With "Bright" Tin-Plated
(Nickel Underplated)
Kovar Leads

FULL of Whiskers
Pure Tin Region without
Sn/Pb Solder Coverage

Edge of Solder Dip

NO Whiskers
Sn/Pb Solder Covers
Tin-Plate Here

year period.

In the brave new world of lead-free solder, those industry averages are not yet known. We suspect the consumer will be very irate if, as anticipated, their TVs, amateur radio equipment, land-line telephones, appliances, and even garage door openers begin to fail at an even faster rate.

Solder Reference

Kester is the world-wide leading manufacturer of solder products. They offer a wealth of information on their website (kester.com) and provide this useful information in table 1.

SnAgCu(Bi) Alloys

Higher melt point lead-free alternative. SnAgCu family is electronics industry standard which in most cases has shown equal or greater thermal cycle fatigue resistance than SnPb.

Higher surface tension and poorer wetting than SnPb.

Ag provides greater strength but less ductility than Pb.

Cu reduces the melting point of the solder. Cu improves thermal cycle fatigue resistance. Cu improves wet ability. Cu retards the dissolution rate of copper from boards and components into the molten solder during soldering.

Bi reduces melting point of the solder. Bi improves wet ability. In the presence of lead from HASL boards or components Bi can greatly reduce thermal cycle fatigue resistance due to the formation of Sn16Pb32Bi52 (MP=95C) which can diffuse along the grain boundaries

TABLE OF ALLOYS

ALLOY:TIN-LEAD	MELTING RANGE °F/°C	WIRE	BAR	SOLDERPASTE	PREFORMS
Sn63Pb37	361/183	X	X	X	X
Sn60Pb40	361-374/183-190	X	X		X
Sn55Pb45	361-397/183-203	X	X		X
Sn50Pb50	361-420/183-214	X	X		X
Sn45Pb55	361-440/183-225	X	X		X
Sn40Pb60	361-460/183-238	X	X		X
Sn35Pb65	361-477/183-247	X	X		X
Sn30Pb70	361-496/183-258	X	X		X
No. 123	366-503/186/262	X	X		
Sn25Pb75	361-514/183-268	X	X		X
Sn20Pb80	361-536/268-302	X	X		X
Sn10Pb90	514-576/268-302	X	X	X	X
Sn05Pb95	574-597/301-314				X
LEAD-FREE	**MELTING RANGE °F/°C**	**WIRE**	**BAR**	**SOLDERPASTE**	**PREFORMS**
Sn96.5Ag3.5	430/221	X	X	X	X
Sn96Ag04	430-444/221-229	X	X		X
Sn95Ag05	430-473/221-245	X	X		X
100%Sn	450/232	X	X		X
Sn95Sb05	450-464/232-240	X	X	X	X
Sn99.3Cu0.7	440/227	X	X		X
Sn96.6Ag3.0Cu0.5	422-428/217-220	X	X	X	X
Sn95.5Ag3.8Cu0.7	422-430/217-221	X		X	X
SAF-A-LLOY	428-454/219-235	X	X		X

REFERENCES

- The trade name Freon® is a registered trademark belonging to E.I. du Pont de Nemours & Company (DuPont)
- Photograph 1 (needlewhisker): Courtesy of Center for Advanced Life Cycle Engineering (CALCE) at University of Maryland
- Photographs 2 (hot dip limitations) & 3(whisker): Courtesy of the NASA Electronic Parts and Packaging (NEPP) Program"
- Solder Reference Tables Courtesy of the Kester Corporation
- Additional website information can be found at: http://nepp.nasa.gov/whisker http://www.calce.umd.edu/

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How to Start Your Own
International Shortwave Radio Station

Many decades ago when I first started listening to shortwave radio, one of my favorite shows was the VOA's Jazz Hour with Willis Conover. I was also a regular listener to WNYW "Radio New York Worldwide." And when, WRNO first started up I was a "Charter Listener." In those days WRNO was the only full-time Top 40 rock radio station on shortwave. It called itself "The Rock of New Orleans World Wide."

U.S. broadcast history is dotted with a number of people who, like WRNO founder Joseph M. Costello III, sought to bring another voice of America to the HF bands. Haven't you ever wanted to do so as well?

❖ FCC Says Yes and No

The U.S. is one of the few countries to allow, if not actually encourage, international shortwave broadcasting by citizens and organizations. The FCC sets out the guidelines for such an effort in a publication called *Fact Sheet on Building a High Frequency (Shortwave) International Broadcasting Station.* The stated requirements are few but a little daunting.

The FCC recognizes the crowded nature of today's HF frequencies and sets a high enough bar that only the really serious will try. Aside from the various filing fees, the FCC requires a minimum power output of 50 kW and a directional antenna array capable of a minimum of 10 dB gain. Those are the actual requirements, but there are other more vague requirements as well: "*...In general, applicants must satisfy the Commission that they are legally, technically, and financially qualified, to build and operate the proposed HF international broadcasting station.*" You can bet you won't get far without a pretty good looking business plan, an accredited radio engineer on staff, and the smarts to step lively through the various flaming hoops the Commission will set before you.

The Commission warns prospective shortwave broadcasters against wanting to simply broadcast to the U.S. alone, but it recognizes that transmitters located at the corners of the continent and beamed across to the rest of the world will, in fact, be broadcasting to the entire U.S. It's not really that concerned.

Nor is it concerned about content. Tom Polzin, with the FCC's International Bureau, told me that they wanted American commercial HF broadcasters to "reflect the cultural values" of our country. That's certainly being done. He said that regulation of the HF bands was "a little bit more wide open" than the country's AM and FM bands. That's for sure; very few AM or FM outlets would keep their licenses with the various SNAFUs encountered by HF broadcasters.

And, as if to scare the heck out of anyone still considering setting up their own HF station, the Commission fires one last sinking shot: "*Individuals or groups considering building and operating an international broadcasting station should consider the quality of the service the station may provide, given the extremely congested frequencies currently available and the high cost of the station. The cost of a station with a minimum transmitter power of 50 kW and a directional antenna with a minimum gain of 10 dB, the land for the station, the studios, and operational cost could easily exceed one million dollars.*" Well, no wonder the private HF landscape is mostly populated by religious organizations. Who else has that kind of money?

There are ways around getting on the air for under a million dollars, but you'll need a lot of help in the way of used or free equipment, cheap land, good neighbors, a helping county commissioner's office, and volunteers. It may be possible to put together a shaky 50 kW signal for a tenth the FCC estimate. But, that's still $100,000!

So, want to give it a shot anyway? Get your investors together, read the Fact Sheet, develop a plan, hire a good engineer and get ready to shell out the bucks. Or....

❖ Shortwave Broadcasters "For Hire"

If you haven't quite got the money or the stamina for the long haul needed to launch your own shortwave HF station, you might consider bringing your passion to the bands via existing HF outlets. The following are the three "for hire" HF International Broadcasters willing to let you be the programmer for a price. (Cheap, compared to $100,000.)

This is WBCQ's log periodic beam antenna for 7.415 MHz which was built by Sommer Antennas of Geneva, FL and takes the station's 50 kW input. It features a 30' boom with the longest element being 60'. (Courtesy: WBCQ The Planet)

WBCQ "The Planet"

Located in Monticello, Maine, WBCQ is the brainchild of long time shortwave activist Allan Weiner who had the courage of conviction to do what you might consider doing: starting your own shortwave station. From his history of pirate shortwave broadcasting in the 1970s, to his current legal on-air activities, his goal has been to offer an HF voice to all comers. He was granted a shortwave broadcast license from the FCC in December 1997. Ten years later, WBCQ is heard on four frequencies: 5.110, 7.415, 9.330, and 17.495 MHz.

You can buy time on WBCQ for your own program, which can be fed to the station for airing by tape, CD, Internet stream or live via telephone. While WBCQ does not publish a rate card and prefers to negotiate rates on each individual contract, they typically charge $75/hour and $40 for half an hour. Per minute price goes down with longer program time and more programs per week.

Billing themselves as "Free Speech Radio," WBCQ tries to attract a wide representation of views for their programming. Tom Barna, an engineer at WBCQ for the last eight years, says that 4 PM to Midnight (ET) is their "prime

time." You'll get the most impact for your money during this period. To learn more about WBCQ visit their web site: **www.wbcq.com** or call 207-538-9180.

WRMI "Radio Miami International"

WRMI started in the 1980s by buying time on existing shortwave outlets to air its programming. In 1994 the FCC granted them an HF license and they were on their own claiming listeners from "Alaska to Tierra del Fuego." WRMI broadcasts on 7.385 and 9.955 MHz.

Not forgetting its own beginnings and always looking for more sources of income, WRMI has been selling broadcast time to a wide variety of political and religious organizations since the beginning. You can get your message out to most of this hemisphere for as little as $1/minute when you buy bulk time slots. Full details may be found on their web site: **www.wrmi.net** or by calling 305-559-9764.

Here's a tip: check out their propagation charts to determine the frequency and time of day you would get the most out of your broadcast buck. WRMI is also known as Radio Cuba Libre for its close ties with the anti-Castro Cuban community in Miami. As a result WRMI's 9.955 MHz frequency gets jammed by the Cuban government whenever their anti-Castro programs air.

WWCR "World Wide Christian Radio"

WWCR began in the Spring of 1989 (see *MT* March 2006) with the plan of selling its transmitter time to any one interested in buying. As with any business, it's been a struggle, but by all accounts it's been a big success. WWCR now uses four 100 kW transmitters on ten frequencies to reach across the continent and world wide. For a current schedule of frequencies and times see: **wwcr.com/wwcr_transmitter/wwcr_transmitter_schedules.html.**

As with the other "for hire" shortwave broadcasters, WWCR charges less per minute the more minutes you buy. They charge $18.50 for 4.5 minutes on a once-a-week basis. That fee drops to $15 when you buy 4.5 minutes five days a week. A once-a-week 29.5 minute show will cost $99. A daily (M-F) 29.5 minute show

Transmitter #4 at WWCR from Continental Electronics pumps out 100 kW. New or used transmitters are still expensive buy, ship and operate. Care to pick up the electric tab at WWCR for a month? You can "borrow" this transmitter for as little as $15 for 4.5 minutes. (Photo by Cameron Keel courtesy WWCR)

drops to $80/show. For more information visit them at **www.wwcr.com** or call 615-255-1300 during normal business hours (Central Time).

QSL sent to early listeners of WRNO "The Rock of New Orleans Worldwide" back when WRNO rocked! This one is dated 2-26-82 (eight days after their on-air launch) embossed with the WRNO seal and signed by the late Joseph M. Costello III, WRNO founder and New Orleans media mogul. (Courtesy: Author)

❖ Final Notes on DIY Shortwave

You could be the next Willis Conover. Well, probably not; he may have been the greatest radio announcer of all time. But, if you've ever thought you'd like to be on the air but couldn't figure out how, this could be your big chance. Look around for a sponsor who might help foot the bill for the air time; set up some simple recording equipment at home, and give HF worldwide shortwave broadcasting a shot. And, there's no cheaper way to address the continent and the world than via shortwave. Compare any of the above prices to satellite or network distribution and it's easily the cheapest.

If you think you still want to start your own station, know that there's barely enough money, even with all the paid religious programs being aired, for the existing American commercial HF stations to meet expenses.

The upside is that we're beginning the climb into the next solar cycle. This means that these commercial HF stations will have far better signals for much greater parts of the day over the next several years. Who knows, your program may just take off!

Not a power line installation but a big time Rhombic array antenna at WWCR's antenna farm. This, along with its 100 kW transmitter, accounts for its needle bending signal strength across North America. Look for plenty of real estate if you plan this type of antenna for your own HF broadcast station. (Photo by Cameron Keel courtesy WWCR)

ASK BOB

Q. *I just purchased a discone antenna but have not yet installed it. If I'm not interested in frequencies below about 121 MHz, can I simply leave off the top vertical element which is for lower frequencies? (Bob Schweikert, N4NMK)*

A. Discone performance is relatively flat from its lowest frequency clear to the top, but performance drops off rapidly below the bottom. It depends, therefore, what the lower cutoff frequency is for the discone and where the vertical whip takes off.

Try tuning in a local airport weather station (ATIS) broadcast with and without the top element. You might even try it with a weak FM broadcaster. That should tell you all you need to know!

Q. *What can I expect for distance of signal reception in the "Close Call" mode of Uniden and Radio Shack scanners? (Steve, email)*

A. Depending on whether you are using the original rubber whip, a mobile antenna, or a base antenna, and on the power of the transmitting station, you should be able to hear handy-talkies for several hundred feet, mobiles up to a half mile or so, and base stations a mile or more away.

Q. *What is the name of the flexible pin plug that can be inserted into the center of a standard shortwave/ CB-style female antenna connector (SO-239) so a single wire can be attached? (Robert Gorsch)*

A. These are also commonly used on test prods for multimeters as well. Because of its shape, it's known as a banana plug and should be in stock at your local Radio Shack.

Q. *I recently purchased a shortwave portable and I notice the presence of many strong interference signals below the AM broadcast band, spaced about every 30 kHz. They stop at the AM band and aren't heard at shortwave frequen-*cies. Any idea what they might be? (Ray Clemmer)

A. Chances are you are picking up some microprocessor radiation from a nearby accessory or appliance, or even the RF radiation from a switching-type power supply. Take the receiver to another part of the house – or even to another house – and try again. If the signal goes away or reduces in strength, that confirms it. If it stays, it's in the radio or its power supply. You can eliminate the power supply as a possible source by connecting the radio to a 12 volt car battery or another (transformer-type) power supply.

Q. *I recently was under a railroad trestle and wondered if a dipole were at its height (175 feet) whether shortwave reception would be substantially better than at, say, 10 feet above the ground. (Mark Burns, Terre Haute, IN)*

A. Yes, I would suspect that a dipole antenna, even with nearly 200 feet of coax – provided it's low-loss coax – would work better at 175 feet height than 10 feet, provided that the railroad trestle doesn't have rails anymore which would alter the pattern of the antenna.

When horizontal antennas are close to the ground at shortwave frequencies, the ground causes reflections which make primary reception overhead rather than from the horizon; these are called near-vertical-incidence antennas.

If the antenna is close to those rails, they behave as reflectors, destroying the horizontal pattern and creating unpredictable lobes and nulls, depending upon their spacing, length and frequency of operation.

Q. *I have designed two different Yagi antennas, one with 10 dB gain and 56 ohm impedance, the other with 8 dB gain and 50 ohm impedance. Which should I go with? (Anwar Ullah)*

A. The slight loss from an impedance mismatch of only a few ohms will be virtually impossible to detect by the receiving station, especially if you are using low-loss transmission line. An S unit on a signal strength meter is 6 dB, and even if you are at the fringe of marginal reception, a dB or two isn't going to make much difference. I doubt you'd see or hear any difference between the two antennas.

Q. *I would like to use the same mobile antenna for both my 2 meter transceiver and my scanner. What type of accessory will split the common antenna to the two radios without overloading the front end of the scanner? (Matt Goodwin, KG6YLJ, Fresno, CA)*

A. Using the same antenna simultaneously for transmitting and receiving is not a good idea, even if you use a good directional coupler like a TV-style splitter (such as carried by Grove). Depending on the amount of power your transmitter puts out, you can damage the front-end RF transistors on your scanner, as well as damage the delicate wiring of the splitter. It's definitely better to use two antennas or an antenna switch that physically disconnects the scanner when the transmitter is to be used.

Even with two antennas or the directional multicoupler, you will have severe signal overload problems on your scanner while you are transmitting. The only way to minimize (probably not entirely cure) that is to install a sharply-tuned, two-meter notch filter on the scanner antenna line. Grove carries the PAR line of filters for a variety of bands, and they are excellent.

Q. *With the imminent arrival of digital TV, how will that affect my reception if I'm currently in a fringe area and get a snowy picture? (L.C., email)*

A. The straightforward answer is that, while analog TV can be seen with snow, digital can't; it's all or none. Either the broadcaster beefs up his signal, or you get a better antenna, or you'll have a blank screen.

Q. *Can you recommend a propagation prediction program to use on HF frequencies? Preferably Freeware, but if the program is exceptionally better than a freeware program then I would consider buying. (John via email)*

A. There are quite a few freeware HF propagation programs that do an excellent job. I have included a few of the better programs (freeware and purchase) available for download from the internet.

W6ELProp™ by Sheldon C. Shallon, W6EL that predicts ionospheric (sky-wave) propagation between any two locations on the earth on frequencies between 3 and 30 MHz. This program is for Windows® 95, 98, ME, XP, 2000, or NT with 2 MB Ram, 2 MB disk space, and a 800x600 256 color monitor or better recommended (but not required). There is no charge for W6ELProp when used for non-commercial purposes. This is a five star prop program and a must-have if you are a ham or SWL. You can download the latest version (2.70) at **www.qsl.net/w6elprop/**

HamCAP (by Alex VE3NEA at **www.dxatlas.com/hamcap/**) is a compact Windows freeware interface program to VOACAP, incorporating both graphical point-to-point and area coverage predictions. The program is pretty much self-contained; the only thing you probably need to get from the Internet is the smoothed International Sunspot Number from the NGDC website. You can find the users guide at **www.voacap.com/ham-cap-guide.html**

Kangaroo Tabor Software's **WinCAP Wizard, CAPMan, Active Beacon Wizard** – Propagation and Beacon Programs. These programs are QSLware. WinCAP Wizard, utilizing the VOACAP engine, is the successor to CAPMan – the recognized leader in HF propagation prediction and system analysis software. WinCAP Wizard is the quick to-the-point HF propagation prediction browser, currently in the fifth major version. You can download it at **www.taborsoft.com/**

PropView is a freeware program that uses the included IonCap propagation prediction engine to forecast the minimum and maximum usable frequencies between two locations over a specified 24 hour period. Results are rendered in an easy-to-understand color-graphic display. You can specify locations via direct latitude/longitude entry. Learn more about this Windows program at **www.dxlabsuite.com/propview/**

DX Toolbox – Shortwave / Ham Radio / HF Radio Propagation. Black Cat's DX Toolbox searches the web for you, gathering information on solar and geomagnetic conditions that affect radio propagation. It also features several propagation forecasting tools, allowing you to quickly and easily estimate current HF (Shortwave) propagation conditions between any two locations in the world. It's ideal for the ham radio operator, shortwave listener, or other radio enthusiast, and is available for Mac OS, Mac OS X, and Windows. While it isn't freeware, the price is right at $24.99. Download it at **www.blackcatsystems.com/software/dxtoolbox.html** *(See page 72 for more on this program suite - ed.)*

Q. *On the frequencies you listed for Westover ARB which one is the input freq.? You have it listed like this 138.0750/148.4625 and so on. (George Dragoon via email)*

A. I always list the repeater output frequency first and the repeater input second in all my frequency lists.

Q. *I live around Daytona Beach, Florida, and on the frequencies of 156.8 and 157.100 MHz, using a Grove flex wire antenna and a BC780xlt, I am hearing USCG sector Charleston, South Carolina. Is this skip or some type of relay from my local Coast Guard station? (Bill Wilstrom via email)*

A. You are hearing Charleston being relayed to your local transmitters via a radio or hardline backbone network. This link works both ways and allows the operators in Charleston to work vessel traffic in your area.

The Coast Guard is responsible for a variety of missions spread over 95,000 miles of coastline in the continental United States, Alaska, Hawaii, Guam, and Puerto Rico, plus America's navigable rivers and lakes. These waterways are used for recreation, commerce, and tourism by more than 78 million boaters.

As part of the National Distress System, the Coast Guard operates approximately 48 Sector field offices, Section and Activity offices, whose responsibilities include listening for distress calls over VHF maritime channel 16. Approximately 15,000 to 20,000 distress calls are made over this VHF system each year.

These stations also listen for distress calls over the international radiotelephone distress frequency 2182 kHz. These Group and Section offices also make voice broadcasts of weather and navigational warnings over VHF channel 22A and 2670 kHz, respectively.

A new system is being fielded and is known as Rescue 21. Rescue 21 will aid the Coast Guard in carrying out their missions by providing an advanced command, control, and communications (C3) system. This new C3 system will be more robust, more reliable, and more capable than the current National Distress System.

Q. *I have found that when I program my two Pro 2055s and two Pro-97s using [ScanCat] software, that it renders my Signal Stalker totally useless. I do a reset of the radio, Stalker works. I program using Win-97, the radio works, but when I again program it with ScanCat, presto, Signal Stalker is as deaf as a cabbage. I tried all of the program settings that I could think of, and it would not restore Signal Stalker sensitivity. Only when I re-programmed with Win-97 or reset the radio would Stalker work again. (Don Edwards via email)*

A. I checked with Jim Springer, the head honcho at ScanCat, and here is his answer. "The short answer is... we are aware of this problem. The medium-short answer is GRE is the author of the software interface inside the radio. We have been going back and forth on this for months, and while Radio Shack is very cooperative, GRE keeps saying it's not even a supported feature (Aircraft Stalker/Close Call), literally no help at all. I am not minimizing the problem, but honestly it only affects the aircraft and GMRS/FRS ranges. For 90% of the people, they won't even notice it is a problem."

Editor Note: I am still investigating this issue further as I do not understand why the WIN-97 software works and ScanCat does not. There appear to be some additional issues that need to be looked at. Does WIN-97 in fact load the aircraft/GMRS bands? Probably not. They may also know that there is an issue here. Until we can get all the players on the record or GRE clears up their firmware issue, this could continue to be an issue for ScanCat users - lvh

Crossing the Digital Divide

Many big city radio systems appear to be very complicated, with lots of trunked radio frequencies and lots of talkgroups. However, large cities don't always mean long, intricate lists of talkgroups. This month we take a look at two radio systems in the City of Angels, where the police and fire departments operate quite well on traditional, conventional radio frequencies. One of those systems is digital, which brings up the issue of encoding versus encryption – an important distinction to make when monitoring.

❖ Los Angeles, California

Hi Dan,

I need your assistance. I recently purchased the Uniden BC246T. Is this scanner capable of receiving Los Angeles Police Department frequencies? I am a bit out of my league on this. If you have any suggestions please advise.
- Mike in California

The Bearcat BC246T is a handheld scanner build by Uniden. It is capable of tracking Motorola, EDACS, and LTR analog trunked systems as well as conventional frequencies. It also has "Close Call" radio frequency capture technology, enabling it to automatically tune to nearby transmissions. It is also able to decode and display Digital Coded Squelch (DCS) and Continuous Tone Coded Squelch System (CTCSS) values sent by many radio systems as subaudible tones.

The BC246T covers six bands of frequencies: 25 to 54 MHz, 108 to 174 MHz, 216 to 225 MHz, 400 to 512 MHz, 806 to 956 MHz (excluding the cellular telephone frequencies, as required by regulation) and 1240 to 1300 MHz.

As capable as the BC246T might be, it is not capable of decoding digital transmissions. Because the Los Angeles Police Department (LAPD) operates radios that use APCO Project 25 digital standards, Mike's scanner will not be able to make sense of LAPD transmissions.

With more than 9,000 officers, the Los Angeles Police Department is the third largest law enforcement agency in the country, behind New York City and Chicago. The LAPD "protects and serves" more than 3 million residents spread out over nearly 500 square miles. It is divided into a number of Divisions assigned to specific functions and geographic areas of the city.
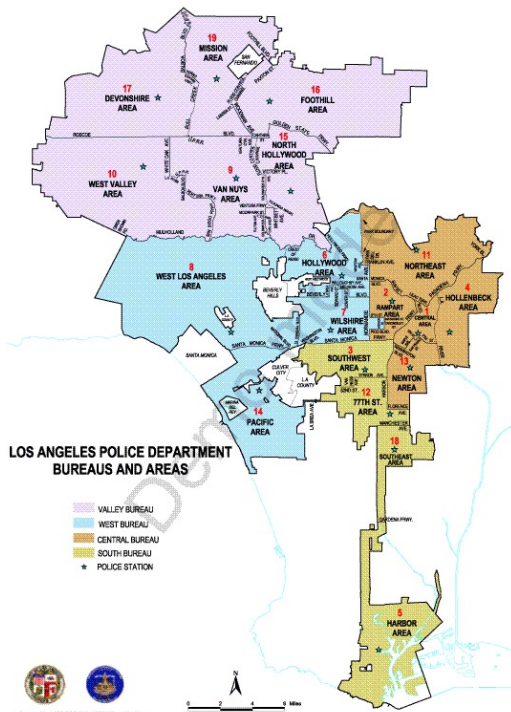
The Communications Division with the LAPD Information and Communications Services Bureau is responsible for the city-wide radio network, as well as the new 9-1-1 PSAPs (Public Safety Answering Points), San Fernando Valley and Metropolitan Dispatch Centers. The Division is the largest within the LAPD, with well over 500 employees.

Most police agencies use some kind of variation on a "10-code," which allows dispatchers and officers to communicate clearly and quickly. "Control," as the Communications Division is known on the radio, uses a number of shorthand code numbers to convey information to officers in the field while minimizing transmission time. In a city as busy as Los Angeles, keeping radio transmissions short is important. Codes used by the LAPD include:

Code	Description
Code 1	Answer your radio
Code 2	Respond to the given location, but don't use lights or siren
Code 3	Respond immediately with lights and siren to the given location
Code 4	No further units need to respond to the incident
Code 5	Unit is on a stakeout, so marked police cars must avoid the given location
Code 6	Unit is at the given location
Code 7	Unit is requesting to temporarily go out of service (for food, etc.)
Code 8	Fire reported in the given area
Code 12	A false alarm
Code 30	Burglar alarm
Code 37	A suspect vehicle is reported stolen

Unlike nearly all other large digital radio systems, the LAPD operates their radios in conventional mode rather than trunked. This means that a specific radio frequency is assigned to a particular purpose, rather than being shared among many. The system uses a total of 57 radio channels operating from 23 repeater sites. The following tables show repeater frequencies for the different divisions within the city, organized by bureau.

LAPD Central Bureau

Frequency	Chnl	Description
506.7375	1	Central Division
506.9375	2	Rampart Division
507.1875	4	Hollenbeck Division
484.8375	11	Northeast Division
484.8625	13	Newton Division
484.8125	24	Central Traffic Division
507.1125	36	Central Bureau (Tactical 1)
484.7875	37	Central Bureau (Tactical 2)

LAPD South Bureau

Frequency	Chnl	Description
506.9875	3	Southwest Division
484.2875	5	Harbor Division
507.2375	12	77th Street Division
506.7875	18	Southeast Division
484.3375	25	South Traffic Division
507.0375	38	South Bureau (Tactical 1)
484.3125	39	South Bureau (Tactical 2)

LAPD West Bureau

Frequency	Chnl	Description
507.2125	6	Hollywood Division
506.9625	7	Wilshire Division
506.7625	8	West Los Angeles Division
484.3875	14	Pacific Division

LOS ANGELES POLICE DEPARTMENT BUREAUS AND AREAS

VALLEY BUREAU
WEST BUREAU
CENTRAL BUREAU
SOUTH BUREAU
★ POLICE STATION

Frequency	Chnl	Description
484.3625	22	West Los Angeles Traffic Division
506.8125	40	West Bureau (Tactical 1)
484.4125	41	West Bureau (Tactical 2)

LAPD Valley Bureau

Frequency	Chnl	Description
506.7125	9	Van Nuys Division
484.9375	10	West Valley Division
484.9625	15	North Hollywood Division
507.1625	16	Foothill Division
506.8875	17	Devonshire Division
484.8875	19	North Valley Division
484.9125	23	Valley Traffic Division
507.0125	42	Valley Bureau (Tactical 1)
507.2250	43	Valley Bureau (Tactical 2)

P-25 Conventional System Channels
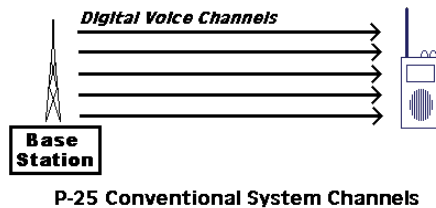
❖ LAPD Unit Names

Each LAPD unit typically has a specific call sign. This call sign is usually made up of three parts: the division number, the type of unit, and the "beat" number. For example, many readers will be familiar with the old television show "Adam Twelve." On the show, the unit was referred to as "1-Adam-12." This call sign can be decoded as follows: the Central Division is assigned the number 1. A patrol unit with two officers is "A" ("Adam" using police radio phrasing). A number, such as 12, refers to a beat or patrol area.

Besides "A," there are several types of patrols:

Patrol Type	Description
CL	Bicycle
FB	Foot patrol ("foot beat")
G	Gang enforcement
L	Supervisor or single ("Lone") officer
M	Motorcycle
OP	Observation Post
T	Traffic
U	Report-taking
W	Detective
X	Extra patrol
Z	Reserve officer

❖ LAPD Air Support Division

The Los Angeles Police Department lays claim to operating the largest non-military air force in the world. The Air Support Division, headquartered at the Piper Technical Center in downtown Los Angeles, maintains 17 helicopters, one fixed wing aircraft and several unmanned aerial vehicles (UAVs). At the top of the Center is the Hooper Heliport, the largest rooftop heliport in the world. The Division logs approximately 18,000 flight hours per year.

The typical mission for ASD is called Air Support to Regular Operations, or ASTRO, where a pilot and a flight officer patrol the skies above city. The Air Support motto is, in fact, "The mission is the same, only the vehicle has changed." ASD units have the ability to monitor LAPD radio frequencies and provide rapid support to ground-based units, especially for high-risk traffic stops. LAPD helicopters are also equipped with LoJack receivers monitoring 173.075 MHz, so they are able to quickly locate and track stolen cars.

Each LAPD has a number of radios, including two VHF aviation transceivers, two APCO Project 25 radios to communicate with ground units, and a wideband transceiver to communicate with other Southern California agencies.

Aviation frequencies in use include:

Frequency	Description
123.025	Primary
123.075	Secondary
122.750	Company 1 (Heliport)
122.850	Company 2 (Heliport)

Note that these aviation frequencies are in AM (amplitude modulation) mode and are not in digital format.

❖ Los Angeles Fire Department

Although most LAPD transmissions are digital, the Los Angeles Fire Department operates a conventional analog radio system in the 800 MHz band. The Bearcat BC246T will do just fine monitoring this system.

Frequency	Chnl	Description
860.9375	1	Operations (Division 1, Central, East and West)
859.9375	2	Operations (Division 2, South and Harbor)
858.9375	3	Operations (Division 3, San Fernando Valley)
857.9375	4	Dispatch (Emergency Medical Service, south of Mulholland)
856.9375	5	Fire Prevention
858.2375	6	Firefigher Emergency
859.4375	7	Dispatch (Fire, south of Mulholland)
858.4375	8	Dispatch (Fire and Emergency Medical Service, north of Mulholland)
857.2375	9	Dispatch (Alternate)
856.2375	10	Operations (Emergency Medical Service, city-wide)
860.7625	11	Fire Command

More information about these channels can be found on the official Los Angeles Fire Department web site at **www.lafd.org/freq. htm**. The department itself employs nearly 4,000 people, including more than 1,000 firefighters spread across 104 neighborhood fire stations. The department radio system consists of 18 radio channels operating from nine repeater sites.

❖ Port Hope, Ontario

Hi there,

Is there away around encrypted frequencies? Our local police forces kept the same frequency but now sounds like something out of the movie Star Wars. I'm in Port Hope, On-

tario, in Northumberland County. Port Hope Police, 142.250 is the frequency.

I look forward to your reply.

- Darren in Ontario

Port Hope is a town of about 15,000 residents on the north shore of Lake Ontario. The town is perhaps most famous for providing uranium fuel for nuclear reactors, with a production history that goes back to World War II.

While searching my frequency listings I did manage to find a reference for the Port Hope Police, listed as operating on 142.245

Digital Voice
(without encryption)

○ Microphone

▢ Voice Encoder/Decoder

▢ Message Formatter

▽ Transmitter

Digital Voice
(with encryption)

○ Microphone

▢ Voice Encoder/Decoder

Key → ▢ Encryption

▢ Message Formatter

▽ Transmitter

MHz, not too far off Darren's report. I only saw one mention of "encryption" but it wasn't clear whether the frequency is really encrypted or merely encoded using digital techniques.

Is there a reader close to Port Hope that has direct experience listening to 142.245 MHz with a digital-capable scanner? If so, please send me an email with your results and I'll report your findings in a future column.

❖ **Encoding versus Encryption**

Encoding is simply the process of converting information from one form into another form. In a digital radio system, voice information is converted from analog form into digital form. The continuously varying analog sound is *encoded* into a stream of digital information made up of zeroes and ones. This stream of binary digits ("bits") is assembled into individual messages, then transmitted to a receiver where it is converted back into an analog signal. All the digital scanners we've discussed in this column are capable of decoding the digital information stream and converting it back into analog form.

Encryption is the process of replacing one set of information with another set according to a secret piece of information called a *key*. Encrypting digital information is a relatively straightforward process these days, although equipment manufacturers typically charge their customers extra for the capability. What that means is that in many departments, only a fraction of radios are capable of encryption. These more expensive units are often issued to detectives and supervisors, not the rank-and-file patrol officer.

Encryption Key Management

Besides cost, handling the secret keys creates additional work for the radio system operators. There are whole sets of procedures, collectively called key management, which

must be followed in order to maintain the security of an encrypted system.

First, the secret key must be generated. In order to be secure, this key must be random enough to not be guessed by someone outside the system. If the key were too simple or too easily guessed, it would be relatively easy for an outsider to figure out the key and decrypt radio traffic. It is similar to using a very simple password on your computer. If it's something really easy to guess, like "password" or your name, then it really doesn't do much good. It is suspected that many encrypted systems in use today, including many radio systems, use secret keys that are relatively easy to guess.

Each radio that is intended to handle encrypted traffic must have the secret key loaded into it, usually with a special piece of hardware known as a *key loader*. This means that each radio needs to located and physically brought into contact with a key loader. The logistics of coordinating such a process, involving all officers bringing their radios to a service facility with a key loader, can be challenging and time-consuming.

Once all the radios are loaded with the secret key, the system can begin encrypted operation. However, that's not the end of the story. In order to maintain security, each key should have a limited lifetime. It should be replaced on a regular basis, in case an adversary has somehow figured out the key currently in use. This lifetime is sometimes referred to as a *cryptoperiod*.

Despite these management difficulties, several jurisdictions have decided to completely encrypt each and every transmission. For instance, law enforcement agencies operating on the county trunked radio system in Orange County, California, use DES-OFB encryption for all their voice traffic. DES stands for Data Encryption Standard, a method of encrypting digital information first specified in the 1970s. OFB stands for Output Feedback, which is a mode of operation for the DES algorithm,

specifying how the encrypted information should be mixed together.

These specifications are produced and maintained by the National Institute of Standards and Technology (NIST), a branch of the federal government. NIST publishes Federal Information Processing Standards (FIPS), which spell out in detail how various encryption functions should be used. NIST also validates products that use FIPS encryption standards.

Techniques to break DES, including trying out all possible keys using brute force, have been honed over the years and improved with increases in computing power. Because of these increasing risks, NIST no longer approves the use of DES for most encryption requirements. DES is in the process of being replaced by the Advanced Encryption Standard (AES), which is believed to be stronger and more resistant to breaking than DES. Although not always a good measure of strength, DES uses keys that are 56 bits long. AES can make use of much longer keys, up to 256 bits. Some proprietary encryption schemes used in older radios use as few as 40 bits, which is not nearly enough to provide effective protection.

APCO Project 25 makes improvements to the security of radio systems. First, there are options to use stronger encryption methods, including AES. There is also a standard on a process called Over The Air Rekey (OTAR), which allows the safe delivery of new secret keys without needing to physically touch each radio.

Despite any possible weaknesses in these encryption schemes, for scanner listeners in both the United States and Canada it is illegal to monitor encrypted transmissions, regardless of how the secret key was determined.

❖ **Dayton Hamvention**

The month of May once again brings the annual Hamvention to Dayton, Ohio. Scheduled for May 18, 19 and 20 at the Hara Arena, the Hamvention brings tens of thousands of radio and electronics enthusiasts to the largest gathering of its kind. Three days of product announcements and demonstrations, technical sessions, and radio-related meetings make it an enjoyable weekend.

In addition, for bargain hunters and experimenters, the Hamvention has 550 indoor exhibit spaces and about 2,500 outdoor flea market spaces where you can find everything from brand new two-way radios to old Civil Defense radiation monitors and everything in between. Like they say, "If you can't find it at Dayton, you can't find it."

More information is available on the official web site at **www.hamvention.org**.

That's all for this month. You can find me searching for vintage computers and calculators during Hamvention weekend; otherwise I'm available by electronic mail at *danveeneman@ monitoringtimes.com*. More information about digital radios and other scanning topics can be found on my web site at **www.signalharbor. com**. Until next month, happy scanning!

Big Savings on Radio Scanners

Uniden®

SCANNERS

Bearcat® 796DGV Trunk Tracker IV with free scanner headset

Manufacturers suggested list price $799.95
CEI Special Price $519.95
1,000 Channels • 10 banks • CTCSS/DCS • S Meter
Size: 6$^{15/16}$" Wide x 6$^{9/16}$" Deep x 2$^{3/8}$" High
Frequency Coverage: 25.000-512.000 MHz., 806.000-956.000 MHz. (excluding the cellular & UHF TV band), 1,240.000-1,300.000 MHz.

When you buy your Bearcat 796DGV Trunktracker package deal from Communications Electronics, you get more. The GV means "Great Value." With your BC796DGV scanner purchase, you also get a **free deluxe scanner headphone** designed for home or race track use. Headset features independent volume controls and 3.5 mm gold right angle plug. The 1,000 channel Bearcat 796DGV is packed with features to track Motorola Type I/II/IIi Hybrid, EDACS, LTR Analog Trunk Systems and Motorola APCO 25 Phase I digital scanner including 9,600 Baud C4FM and CQPSK. Also features control channel only mode to allow you to automatically trunk many systems by simply programming the control channel, S.A.M.E. weather alert, full-frequency display and backlit controls, built-in CTCSS/DCS to assign analog and digital subaudible tone codes to a specific frequency in memory, PC Control and programming with RS232C 9 pin port (cable not supplied), Beep Alert, Record function, VFO control, menu-driven design, total channel control and much more. Our CEI package deal includes telescopic antenna, AC adapter, cigarette lighter cord, DC cord, mobile mounting bracket with screws, owner's manual, trunking frequency guide and one-year limited Uniden factory warranty. For maximum scanning enjoyment, order magnetic mount antenna part number ANTMMBNC for $29.95. For complete details, download the owners manual from the **www.usascan.com** web site. For fastest delivery, order on-line at www.usascan.com.

Bearcat® BCT8 Trunk Tracker III

Manufacturer suggested list price $299.95
CEI Special Price $169.95
250 Channels • 5 banks • PC Programmable
Size: 7.06" Wide x 6.10" Deep x 2.44" High
Frequency Coverage: 25.0000-54.0000 MHz., 108.0000-174.0000 MHz., 400.0000-512.0000 MHz., 806.0000-823.9950 MHz., 849.0125-868.9950 MHz., 894.0125-956.0000 MHz.

The Bearcat BCT8 scanner, licensed by NASCAR, is a superb preprogrammed 800 MHz trunked highway patrol system scanner. Featuring TrunkTracker III, PC Programming, 250 Channels with unique BearTracker warning system to alert you to activity on highway patrol link frequencies. Preprogrammed service searches makes finding interesting active frequencies even easier and include preprogrammed police, fire and emergency medical, news agency, weather, CB band, air band, railroad, marine band and department of transportation service searches. The BCT8 also has preprogrammed highway patrol alert frequencies by state to help you quickly find frequencies likely to be active when you are driving. The BCT8 includes AC adapter, DC power cable, cigarette lighter adapter plug, telescopic antenna, window mount antenna, owner's manual, one year limited Uniden warranty, frequency guide and free mobile mounting bracket. For maximum scanning enjoyment, also order the following optional accessories: External speaker **ESP20** with mounting bracket & 10 feet of cable with plug attached $19.95. Magnetic Mount mobile antenna **ANTMMBNC** for $29.95.

Bearcat® BCD396T Trunk Tracker IV

Suggested list price $799.95/**CEI price $519.95**
APCO 25 9,600 baud compact digital ready handheld TrunkTracker IV scanner featuring Fire Tone Out Paging, Close Call and Dynamically Allocated Channel Memory (up to 6,000 channels), SAME Weather Alert, CTCSS/DCS, Alpha Tagging.
Size: 2.40" Wide x 1.22" Deep x 5.35" High
Frequency Coverage: 25.0000-512.0000 MHz., 764.0000-775.9875 MHz., 794.0000-823.9875 MHz., 849.0125-868.8765 MHz., 894.0125-956.000 MHz., 1240.0000 MHz.-1300.0000 MHz.

The handheld BCD396T scanner was designed for National Security/Emergency Preparedness (NS/EP) and homeland security use with new features such as **Fire Tone Out Decoder**. This feature lets you set the BCD396T to alert if your selected two-tone sequential paging tones are received. Ideal for on-call firefighters, emergency response staff and for activating individual scanners used for incident management and population attack warning. **Close Call Radio Frequency Capture** – Bearcat exclusive technology locks onto nearby radio transmissions, even if you haven't programmed anything into your scanner. Useful for intelligence agencies for use at events where you don't have advance notice or knowledge of the radio communications systems and assets you need to intercept. The BCD396T scanner is designed to track Motorola Type I, Type II, Hybrid, SMARTNET, PRIVACY PLUS, LTR and EDACS® analog trunking systems on any band. Now, follow UHF High Band, UHF 800/900 MHz trunked public safety and public service systems just as if conventional two-way communications were used. **Dynamically Allocated Channel Memory** - The BCD396T scanner's memory is organized so that it more closely matches how radio stations actually work. Organize channels any way you want, using Uniden's exclusive dynamic memory management system. 3,000 channels are typical but **over 6,000 channels are possible** depending on the scanner features used. You can also easily determine how much memory you have used and how much you have left. **Preprogrammed Systems** - The BCD396T is preprogrammed with over 400 channels covering police, fire and ambulance operations in the 25 most populated counties in the United States, plus the most popular digital systems. **3 AA NiMH or Alkaline battery operation and Charger** – 3 AA battery operation - The BCD396T includes 3 premium 2,300 mAH Nickel Metal Hydride AA batteries to give you the most economical power option available. You may also operate the BCD396D using 3 AA alkaline batteries. Unique Data Skip - Allows your scanner to skip unwanted data transmissions and reduces unwanted birdies. Memory Backup - If the battery completely discharges or if power is disconnected, the frequencies programmed in the BCD396T scanner are retained in memory. Manual Channel Access - Go directly to any channel. LCD Back Light - A blue LCD light remains on when the back light key is pressed. Autolight - Automatically turns the blue LCD backlight on when your scanner stops on a transmission. Battery Save - In manual mode, the BCD396T automatically reduces its power requirements to extend the battery's charge. Attenuator - Reduces the signal strength to help prevent signal overload. The BCD396T also works as a conventional scanner to continuously monitor many radio conversations even though the message is switching frequencies. The BCD396T comes with AC adapter, 3 AA nickel metal hydride batteries, belt clip, flexible rubber antenna, wrist strap, SMA/BNC adapter, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO or ESAS systems. Order on-line at www.usascan.com or call 1-800-USA-SCAN.

More Radio Products

Save even more on radio scanners when purchased directly from CEI. Price includes delivery in the continental USA excluding Alaska.
Bearcat 898T 500 channel Trunktracker III base/mobile..............$209.95
Bearcat 796DGV 1,000 channel Trunktracker III base/mobile.......$519.95
Bearcat BCD396T APCO 25 Digital scanner with Fire Tone Out..$519.95
Bearcat 246T up to 2,500 ch. Trunktracker III handheld scanner...$214.95
Bearcat Sportcat 230 alpha display handheld sports scanner.....$184.95
Bearcat 278CLT 100 channel AM/FM/SAME WX alert scanner...$129.95
Bearcat 248CLT 50 channel base AM/FM/weather alert scanner..$104.95
Bearcat 92XLT 200 channel handheld scanner.......................$109.95
Bearcat 72XLT 100 channel handheld scanner............................$99.95
Bearcat BR330T up to 2,500 ch. Trunktracker III with Tone out $274.95
Bearcat BCT8 250 channel information mobile scanner................$169.95
Bearcat 350C 50 channel desktop/mobile scanner....................$104.95
AOR AR16BQ Wide Band scanner with quick charger..............$199.95
AOR AR3000AB Wide Band base/mobile receiver....................$1,079.95
AOR AR5000A+3B Wide Band 10 KHz to 3 GHz receiver........$2,599.95
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CANADA

CHU Stays Put!

CHU, the Canadian standard frequency and time station operated by the National Research Council, will not have to leave 7335 kilohertz (kHz). The station is announcing on-air, in its usual English and French, that its license has been modified to authorize transmissions as a broadcast, rather than as a utility in the fixed service.

Readers of this column know that the problem was due to an international treaty, which reallocated this band segment to broadcasting and was due to take effect March 31, 2007. CHU had to find an option that would not exceed its tight budget, and it polled its listeners for their input. The conclusions given from this outreach were that people still use the service; 7335 is by far the most popular frequency; and the license should be changed. Now this has been done.

Listen for CHU's transmitters coming from their site near Ottawa on 3330, 7335, and 14670 kHz. Emission is R3E, or upper sideband (USB) with a reduced carrier. It can be tuned in amplitude modulation (AM) or USB mode. Power is 3 kilowatts on 3 and 14 megahertz, and 10 kW on 7335, from vertical antennas. Reception gets a bit spotty in Western Canada, but phone lines and the US station WWV can be used as a fallback.

This signal is controlled by secondary atomic standards periodically zeroed to the primary ones at the NRC time office 20 kilometers away. CHU is used by computer network time setting programs, shortwave listeners, and a few "atomic" clocks which can set themselves to the data pulses broadcast between seconds 31 and 39 of each minute. Despite propagation uncertainties, accuracy on shortwave is slightly better than over the telephone, which has a less predictable lag.

Yes, CHU will QSL (acknowledge) all reports with an attractive card. Their address is Radio Station CHU, National Research Council of Canada, 1200 Montreal Road, Bldg M-36, Ottawa, Ontario, Canada K1A 0R6. Also, more than you'll ever need to know is

at the station's web site, **inms-ienm.nrc-cnrc. gc.ca/time_services/shortwave_broadcasts_e.html**

❖ Latest Beacon Mystery:

On January 23rd, a mysterious beacon popped up on the radio. It identified with the letters "PUN" in Morse code.

PUN was first discovered at the low ends of 40-meter and 20-meter amateur, where thousands of DX chasers listen day and night, with huge, high-gain antennas and sensitive receivers cranked wide open. Needless to say, the hams did not appreciate the company.

Coverage is wide, but spotty. The few people who've been able to get very strong signals have found the mode to be modulated CW (MCW), with a 780-hertz tone on a standard double-side-band amplitude modulation (AM) carrier. The best conditions have also made a weak voice identifier audible. In Spanish, it's "Pista Las Peñas."

PUN was assumed to be a bootlegger or a ham wanting attention, until listeners started finding non-amateur frequencies, and a lot of them. A pattern started to emerge.

Let's do some arithmetic. First, we'll list all the confirmed hits: They are 1752, 3504, 7008, 8760, 10512, 12264, 14016, 19272, and 21024 kHz. It doesn't take long to see that all these are multiples of 1752, right up through the entire spectrum reliably propagated by the ionosphere at this point in the cycle. This is dizzy.

PUN's signal sounds like an aeronautical navigation beacon, but these do not need to broadcast all over HF. The frequency coverage is more suggestive of a propagation beacon. Of course, PUN might simply be a badly malfunctioning transmitter with the worst harmonic problem – and the broadest antenna – in the recent history of radio. The only flaw in this theory is that three frequencies in the harmonic sequence are skipped – 5256, 15768, and 17520 kHz. By now, someone would certainly have heard these.

Listeners have tried other harmonic sequences based on possible fundamentals in the traditional aero beacon band. Unfortunately, none of these have led to audible signals on the predicted frequencies.

So what the heck is PUN? Propagation and beam headings from amateurs with rotary antennas suggest an origin in South America. One can always fire up good old Google and drop in "Pista Las Peñas." They'll get references to a small, private air strip on Puna Island near Guayaquil, Ecuador. While this sounds pretty convincing, there's still no proof. Meanwhile, PUN continues to spew harmonically related signals into the ether.

❖ This Month's Cuban Strangeness

The Cuban numbers weirdness just keeps on coming. Of course, we're talking about good old V2a and M8a, the numeric designators given by the online incarnation of the European Numbers Information Gathering and Monitoring Association (ENIGMA 2000).

V2a, the Spanish voice "Atencion!" station, suddenly changed its oldest schedule, when it disappeared from 7975 kHz daily at 1600 Coordinated Universal Time (UTC) and from 8010 daily at 1700. The new frequencies are 16178 kHz at 1600, and 17436 at 1700.

These frequencies are a bit high for Cuban numbers. They briefly went that high at the top of the last solar cycle, but now we are nearing the absolute bottom. All last year, they never went above 14550 kHz. From Cuba, these schedules are only useful for transcontinental reception, skipping over the usual target areas in the southeastern US.

There's evidence of parallel frequencies, which appear to change often. One day at 1600, Chris Smolinski and other listeners heard what was apparently a test transmission. After a count in the M8a Morse code mode, the voice came up with repetition of single digits. 6768 kHz was "uno," and 16178 was "tres" (1 and 3 in Spanish). If there was a "dos" (two), no one heard it.

Even so, these sound like frequency numbers. It's safe to assume use of 6 and 9 megahertz parallels. Heard so far are 6768, 6867, and 9060 kHz AM at 1600, plus 6867 and 9323 kHz AM at 1700.

V2a continues to use two different machine voices, and some lucky listeners have heard Microsoft Windows XP sound effects in the transmissions. Never a dull moment with these people.
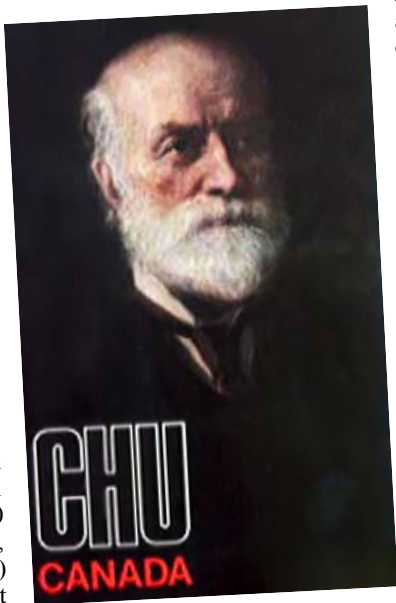
ABBREVIATIONS USED IN THIS COLUMN

AFB.............. Air Force Base
ALE............... Automatic Link Establishment
AM .... Amplitude Modulation
AWACS .... Airborne Warning and Command System
CAMSLANT ... Communication Area Master Station, Atlantic
CAMSPAC ..... Communication Area Master Station, Pacific
CW .... On-off keyed "Continuous Wave" Morse telegraphy
E3 .... UK MI6/SIS Poacher tune, female, 5-number groups
E10............... Israeli phonetic alphabet, female with 5-letter groups
E25............... Unknown agency, Arabic pop music and English voices
EAM.............. Emergency Action Message
FAX............... Radiofacsimile
FEMA............ US Federal Emergency Management Agency
HFDL .... High-Frequency Data Link
HF-GCS .... High-Frequency Global Communication System
JSTARS .... Joint Surveillance Target Attack Radar System
LDOC .... Long Distance Operational Control
LSB .... Lower Sideband
M8a.............. Cuban 3-msg CW/MCW, ANDUWRIGMT = 1-0
MX................ Russian single-letter CW beacons
MARS............ Military Affiliate Radio System
Meteo .... Meteorological
MCW .... Modulated CW or AM tone Morse telegraphy
PACTOR .... Packet Teleprinting Over Radio
RTTY .... Radio Teletype
Selcal............ Selective Calling
SHARES......... SHAred RESources, US federal net
STANAG........ STANdardization AGreement
Unid.............. Unidentified
US .... United States
USCG .... United States Coast Guard
UK................ United Kingdom
V2a.............. "Atencion" Spanish numbers, 3-msg format

All transmissions are USB (upper sideband) unless otherwise indicated. All frequencies are in kHz (kilohertz) and all times are UTC (Coordinated Universal Time). "Numbers" stations have their ENIGMA (European Numbers Information Gathering and Monitoring Association) designators in ().

2743.0   ULX2-Israeli Intelligence (E10) null-message format, AM callup only, parallel 4880, at 1800. (Ary Boender-Netherlands)

2899.0   Gander-North Atlantic air route control, net B, NFD, position check with Continental 46, at 0319. (Ron Perron-MD)

2971.0   Shanwick-North Atlantic net D, position from US Air Force transport Reach 0182, at 0322. (Perron-MD) North American 7019, working Gander for a company message and weather, came from 5649, at 0534 (Allan Stern-FL) Giant 8459-Atlas Air Boeing 747-200 (N506MC), answered selcal AG-EL from Shanwick, at 0645. (Patrice Privat-France)

3016.0   Santa Maria-North Atlantic net A, Azores, position from unknown aircraft at 0329. (Perron-MD) TFL716-Arke Fly Boeing 767-383/ER, (PH-AHX), answered selcal CR-BE, at 0640. OOM116-Zoom Airlines B767-306ER (C-GZNA), answered selcal PQ-CD, at 0650. (Privat-France)

3415.0   ART2-Israeli Intelligence (E10), AM callup only, parallel 5435, at 1800. (Boender-Netherlands)

4270.0   PCD-Israeli Intelligence (E10), AM callup, parallel 6498, at 1630. (Boender-Netherlands) PCD, callup and message which stopped in the middle, at 1934. (Mike L-West Sussex, UK)

4271.0   CFH-Canadian Forces Metoc Centre, Halifax, NS, RTTY weather for Canadian airports, at 0815. (Privat-France)

4350.5   KSM-Maritime Radio Historical Society, Pt. Reyes, CA, weekly CW marker wheel and standby for any Morse traffic, simulkey on 6474 (very loud), 12993 (weak/readable), and 16914 (weak/readable), at 2208. (Hugh Stegman-CA)

4461.0   FTJ2-Israeli Intelligence (E10), AM callup only, at 1800. (Boender-Netherlands)

4560.0   YHF-Israeli Intelligence (E10), AM callup, parallel 5820, at 1630. (Boender-Netherlands) YHF1, test callup with no message, at 2104. (Mike L-UK)

4880.0   ULX 1-Israeli Intelligence (E10), AM test callup at 1630. (Boender-Netherlands)

4996.0   RWM-Standard time and frequency transmission, Mendeleevo, Russia, with a repeated cycle of CW identifier, 1-second pips, unknown data pulse mode, and key-down carrier; audible for hours. (Richard W. Parker-PA)

5010.0   ZY12-Possible Romanian Military, calling ZY10 in ALE, at 2022. (Privat-France)

5091.0   JSR2-Israeli Intelligence (E10), AM callup only, at 1800. (Boender-Netherlands) JSR, callup and message at 1904. (Mike L-UK)

5313.5   Attcnyrbase180-AT&T National Security/ Emergency Preparation net, Conyers, GA, ALE sound at 2047. (Jack Metcalfe-KY)

5378.0   COLASCOLAS4-Cold Asphalt Company, Paris, France, calling ILLIZICOLAS4, Illizi, Algeria, ALE at 2119. (Privat-France)

5470.0   Unid-Turkish Army, numbers in Turkish, usually 2200 but this time at 1955. (Boender-Netherlands)

5550.0   New York-Caribbean net A, position and selcal check with British Airways Speedbird 23, at 0028. (Perron-MD) Reach 516-US Air Force Air Mobility Command transport, selcal check BS-AC with New York, at 0028. American 182-American Airlines B777, selcal check BK-LM with New York, at 2335. (Stern-FL)

5565.0   244-Possible Chinese Military, ALE to 514 at 2010, and to 334 at 2013. (Privat-France)

5616.0   Gander-North Atlantic net B, position from various aircraft at 0014. (Perron-MD)

5696.0   Coast Guard 2112-USCG helicopter, setting guard with CAMSLANT at 2219. (Mark Cleary-SC)

5732.0   Panther-US Drug Enforcement Administration, Bahamas, calling Shark 13 (USCG Cutter *Mohawk*), at 1757. (Cleary-SC)

5821.0   WGY901-FEMA Region 1, Maynard, MA, calling "any station this net" at 1606. (Metcalfe-KY)

6210.0   FDU-Israeli Intelligence (E10), AM callup and message at 1537. (Boender-Netherlands)

6428.0   ABC-Israeli Intelligence test callup (E10), twice at 2137. (Boender-Netherlands)

6498.0   PCD-Israeli Intelligence (E10), callup and message at 2102. (Mike L-UK)

6640.0   Air Canada 073-Flight patching company dispatch via Aeronautical Radio, Inc LDOC regarding a medical situation, at 0838. Continental 1666, patch via ARINC New York to MedLink regarding diversion with a medical emergency, at 0851. (Stern-FL)

6721.0   R26141-US Army helicopter, ALE to T12, 12th Aviation, also on 5708, at 1212. (Cleary-SC)

6761.0   64-14839-Tail number of US Air Force Reserve tanker, refueling coordination with unknown aircraft, at 2348. (Cleary-SC)

6768.0   Unid-Probably a Cuban Intelligence (V2) test transmission, repeating "uno" in AM at 1600. (Chris Smolinski-MD)

6840.0   EZI-Israeli Intelligence (E10), callup and message at 2035. (Mike L-UK)

6855.0   Cuban Spanish AM female "numbers" (V2a), bad interference from WYFR religious broadcast, at 2100. (Bill Seamans-LA)

6867.0   Cuban Spanish AM female "numbers" (V2a), faint MCW M8a in the background and drifting badly, at 1600. (Seamans-LA) *[May be another 7975 replacement. -Hugh]*

6881.0   NN0MRG-US Navy/Marine Corps MARS NNN0MRG, PACTOR bulletins at 1646. (Metcalfe-KY)

6985.0   USADA1010-US Department of the Army, The Pentagon, VA, ALE sounding at 0001. (Perron-MD)

7000.0   JL5-Possible Mexican Military, ALE to JL21 and scrambled voice, at 0025. (Stegman-CA) FUV-French Navy, Djibouti, STANAG 4285 test loop using International Telegraph Alphabet #2, at 2215. (Mike Chace-Ortiz-ME)

7038.7   "D"-Russian Navy CW cluster beacon (MX), Odessa, also on

8494.7 and 10871.7, at 1358. (Boender-Netherlands)

7039.0 "C"-Russian Navy CW cluster beacon (MX), Moscow, also on 10872, 13528, and 16332, at 1357. (Boender-Netherlands)

7527.0 Juliet 41-USCG helicopter, securing guard with CAMSLANT at 1545. (Cleary-SC)

7611.0 FAAZBW-US Federal Aviation Administration, Boston, MA, ALE sound at 1227. (Perron-MD)

7887.0 Cuban Spanish female "numbers" (V2a), AM callup 20481 at 2002, cut to Radio Nacional Venezuela, then back to numbers at 2004. (Cam Castillo-Panama)

7975.0 Cuban Spanish female "numbers" (V2a), AM callup 31953 31953 31953, at 1603. (Castillo-Panama) *[This schedule moved to 16178 kHz 2 days later. -Hugh]*

8009.0 Cuban CW cut numbers (M8a), at 2300. (Perron-MD)

8012.0 040NHQCAP-US Civil Air Patrol, possibly the Chief of Staff office, ALE sounding at 1058. (Perron-MD)

8040.0 GYA-UK Royal Navy Fleet Weather and Oceanographic Centre, Northwood, FAX chart at 2303. (Perron-MD)

8061.0 ILLIZICOLAS4-Cold Asphalt company, Illizi, Algeria, working COLASCOLAS4, Paris, France, at 2113. (Privat-France)

8065.0 RCH638-US Army 1/228th Aviation, ALE to SKYWAT (Skywatch, Soto Cano, Honduras), at 0119. (Perron-MD)

8096.0 Cuban MCW "cut numbers" (M8a) callup 96092 77852 98962, at 1800. M8a, MCW callup 78662 05324 23762, at 1806. M8a, MCW callup 96091 77851 98961, at 1900. (Castillo-Panama)

8104.0 "Caribbean Yachters Net"-Various vessels getting weather for Caribbean ports, at 1311. (Perron-MD)

8113.0 VMW-Wiluna Meteo, Australia, coastal weather forecast at 1337. (Perron-MD)

8135.0 Cuban CW cut numbers (M8a), at 2308. (Perron-MD)

8176.0 VMC-Charleville Meteo, Australia, high seas weather forecast at 1335. (Perron-MD)

8270.0 PR1-Venezuelan Navy, Radio Station #1, ALE to CGA, Navy Headquarters, at 1252. (Perron-MD)

8294.0 WEJ-International Maritime Shipping Agents, Miami, FL, selcalling and working vessel *Rio Haina* in Spanish, at 1245. WEJ, working vessel *Rio Miami* in Spanish, at 1325. (Perron-MD) WBN6510-Seagoing tugboat *Sentinel*, checking in with Jacksonville at 1813. (Cleary-SC)

8810.0 AL5T-Venezuelan Coast Guard/ Riverine Forces, LSB ALE to 1EW1, at 1311. (Perron-MD)

8903.0 Kano-Africa/Indian Ocean air route net 4, Nigeria, position from LTU 161 at 2141. (Perron-MD)

8960.0 Luanda-Regional air control net, Angola, position from unid aircraft at 2205. (Perron-MD)

8983.0 CAMSPAC Point Reyes-USCG, CA, working C-130 Coast Guard 1701, at 0022. (Stern-FL) CAMSLANT-USCG, VA, working helicopter Coast Guard 2102, at 1334. Stingray 1081-Possible US Customs helicopter, working CAMSLANT at 1537. Coast Guard 2112, helicopter working CAMSLANT at 1831. Coast Guard 1501, an HC-130, working CAMSLANT at 1501. (Cleary-SC)

9025.0 NM2-Unknown US military, ALE to NW1 (Nightwatch airborne command post), at 1610. (Perron-MD) Sentry 40-US Air Force E-3 AWACS, ALE initiated patch via Diego Garcia to Raymond 24 (Tinker AFB, OK), at 2159. (Cleary-SC)

9063.0 Cuban Spanish female "numbers" (V2a), 5-figure groups in progress at 1610. (Castillo-Panama) *[Possible new parallel to 16178. -Hugh]*

9200.0 3000-Italian Carabinieri (military police), ALE phone patch request ("DIAL4") to 2053, at 0650. (Privat-France)

9338.0 XPA2-Israeli Intelligence (E10), callup only at 1140. (Mike L-West Sussex)

9380.0 AL5T-Venezuelan Coast Guard, LSB ALE to 1EW1, also on 8810, at 1213. (Perron-MD)

9450.0 Unid-Arabic Music Station (E25), new-format callup and message at 1240. (Mike L-UK)

10194.0 WGY908-FEMA Region 8, Denver, CO, test patch to WGY947, Iowa State Emergency Operations Center, at 1603. (Metcalfe-KY)

10588.0 WGY901-FEMA Region 1, Maynard, MA, working WGY908, FEMA Region 8, Denver, CO, at 1403. (Cleary-SC)

10692.5 WAROPS-US Army 1/228th Aviation ("Winged Warriors") Operations, Soto Cano Air Base, Honduras, ALE to helicopter RUH957, at 2028. (Perron-MD)

10780.0 Cape Radio-US Air Force, Cape Canaveral Air Force Station, FL, working B-1B Dark 51, at 1520. (Stern-FL)

11175.0 Offutt-US Air Force HF-GCS, NE, with a long 248-character EAM, at 1431. Offutt, all-frequency call for Shogun 01 (US Air Force), at 2003. Andrews-US Air Force HF-GCS control station, MD, voice and "2-tone Alpha-11" data with Armament (probable Nightwatch net), then went to 11220, at 2310. (Jeff Haverlah-TX) Anvil 63-US Air Force C-130, patch via McClellan HF-GCS with arrival info for unknown base ops, at 1547. Reach 194-US Air Force, patch via Puerto Rico HF-GCS to Shaw AFB Meteo for Honduras arrival weather, at 1720. (Cleary-SC)

11205.0 Shark 47-US Joint Task Force C-130, working Smasher (Southern Command flight watch, Key West, FL), at 1643. (Cleary-SC) Shark 47, working Smasher at 1932. (Perron-MD)

11220.0 Andrews-US Air Force, Andrews AFB, MD, working Armament, came from 11175, setting up on several Zulu frequencies, at 2321. (Haverlah-TX)

11232.0 Darkstar Quebec-US military E-3 AWACS, possibly Nightwatch net, patch via Trenton to Best Deal, at 1400. Canforce 2376-Canadian Forces CC-130, getting weather from Trenton at 1418. (Cleary-SC) Peach 66-US Air Force E-8 JSTARS, patch via Trenton Military to Peachtree Ops, then Peach 32, another JSTARS, calling Peach 66 with no joy, all at 1914 (Perron-MD)

11300.0 Tripoli-Africa/Indian Ocean air net 3, position from British Airways Speedbird 55K, at 2127. (Perron-MD)

11485.0 WGY9030-FEMA Auxiliary station, TX, sending an ALE exercise message to USDAHQ1, US Department of Agriculture, DC, at 1632. (Perron-MD)

11545.0 Lincolnshire Poacher-UK Intelligence (E3), identifier 64364, parallel 13375, at 1803. (Boender-Netherlands)

12577.0 P3AG4-Bulk carrier *Irini F*, Digital Selective Calling safety test with Valencia Radio, Spain, at 0935. 3EFW-Panamanian registry vessel *Yusho Regulus*, DSC safety test with Greek Coast Guard, at 1126. (Privat-France)

13306.0 New York-North Atlantic air net A, position from Speedbird 18, at 1530. (Perron-MD)

13339.0 Aeromexico Operations-Company LDOC, weather for Aeromexico 407 in Spanish, at 2040. (Perron-MD)

13927.1 AFA2MH-US Air Force MARS, GA, patching Dark 51, a US Air Force B-1B, to a Defense Switch number, at 1328. AFA2XD-US Air Force MARS, patching Music 83 (TN Air National Guard C-130H) to Bangor, at 1605. (Stern-FL) CORSO 74-Puerto Rico Air National Guard, MARS patch via AFA3HS to Tinker AFB, at 2129. (Cleary-SC)

14396.5 WNIY791-Southwestern Bell, Dallas, TX, SHARES Coordination Net check-in, along with WPEE982 (AT&T Denver), WPDY885 (AT&T Reno), WGY9494 (FEMA, CO), WGY9925 (FEMA, MO), and WGY9927 (FEMA, MI), starting at 1641. (Metcalfe-KY)

14569.0 CLC51-Venezuelan Army 51st Jungle Infantry, ALE to SCLC514, 514th Jungle Infantry, at 2257. (Perron-MD)

14606.1 AFA6PF-US Air Force MARS, CA, patching Air Mobility Command transport Reach 1LT to a number in Massachusetts, at 1708. (Stern-FL)

16178.0 Unid-Probably a Cuban Intelligence (V2) test transmission, repeating "tres" in AM, at 1600. (Smolinski-MD) *[Another listener heard this start as M8 with a test count before it switched to V2. -Hugh]*

16331.9 "S"-Russian Navy CW cluster beacon (MX), Archangelsk, at 1357. (Boender-Netherlands)

17458.5 N080DN-North Dakota National Guard, ALE to HQ703N, National Guard Readiness Center, Arlington VA, at 1910. (Perron-MD)

17487.0 494FEMAUX-FEMA, Denver, CO, ALE to AAT3BFMARS (US Army MARS, Delaware), at 1654. (Perron-MD)

18248.6 KWG41-US Department of State, DC, ALE sounding, also 20810.6, at 1325. (Perron-MD)

18267.0 HOUSTON-Texas Public Health Net, LSB ALE sounding, also 15661, at 2126. (Perron-MD)

21997.0 "13"-HFDL ground station, Santa Cruz, Bolivia, working aircraft at 1802. (Perron-MD)

23433.0 ELPASO-Texas Public Health Net, LSB ALE sounding, also on 20662, at 2109. (Perron-MD)

Digital Alligators on HF?

No, it's not a belated April Fool, but this month we focus on an often heard NATO mode that sometimes outfoxes new listeners. There is also news of a new Algerian ALE network and we take a look at a rare variant of the French Forces ARQ-E mode that is a regular fixture on HF at the moment.

❖ Mode of the Month: Link-11

What do TADIL-A, Link-11, CLEW, SLEW and Alligators all have in common? Well, turns out that they are all different names for the same digital data mode, one that can be heard very regularly on HF at just about any time of the day and location.

Most commonly referred to as Link-11 or MIL-STD-188-203-1A, this mode is used to distribute tactical data (usually fire control or radar) among fixed stations and mobiles on land, sea or in the air. Although it can be used (and has been heard) on VHF and UHF, it is most often heard on the HF bands. The largest user by far is the US Navy, though many NATO countries have the ability to work with this mode.

Once identified by ear, the mode is hard to mistake. The characteristic "rink, dink, dink, raaaaassssp" sound of the Link-11 bursts is one of the easiest to recognize. On a spectrum scope, the most commonly heard variant CLEW (Conventional Link Eleven Waveform) signal has an interesting structure as you can see from the screenshot below. (If you recognize the picture, it's because it ran last month in error; for the correct image of last month's MIL-188-110A waveform, see page 4.)
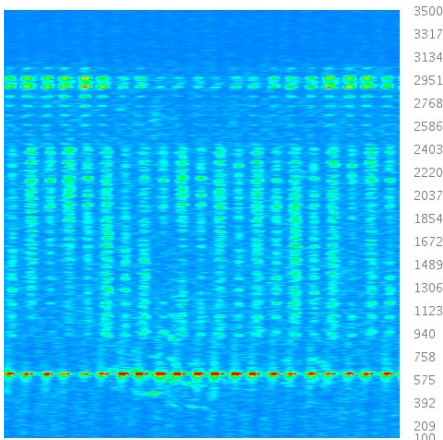
At approximately +605Hz you can note the presence of a distinctive, unmodulated pilot tone which is used by the receiving modem to track frequency errors due to Doppler shift. Then follow 14 tones of 4PSK modulated data, each spaced at 110Hz starting at +935Hz and ending at +2365Hz. Finally, there are two more PSK modulated tones placed around +2915Hz. These are used for synchronization purposes. With that configuration, the system achieves a data rate of 1364bps.

Signals are sent in USB on a whole kilohertz point most of the time, but it's not too unusual to find LSB being used. Which way round is easy to tell as listening to an LSB-sent signal on a USB radio will have the Doppler tone at the high end of the spectrum instead of the lower. The faster 2250bps SLEW (Single-tone Link Eleven Waveform) is not usually heard on HF.

Like most venerable modes, Link-11s tend to use the same channels pretty regularly, daytime and early evening around 9MHz being a particular favorite for some reason. I have several cases where the transmissions reappear on the same frequency years after having been first logged there. Here are some recently active channels:

2644.4, 3065, 4013.5, 4135, 4156, 4702, 5171, 5446, 5588, 6653, 8008, 8056, 8328, 8898, 9020, 9121, 11445, 17490 kHz USB

Finally, you can hear an audio clip at Leif's site (see Resources) before you start hunting for the signal yourself.

❖ French Forces 184.6bd ARQ-E

Fewer and fewer examples of the French Forces ARQ-E signals are left on the HF bands these days. Most usually, the 100bd, 192bd and 200bd modes are heard, if at all. Lately, however, the more unusual 184.6bd variant has been putting an excellent signal both day and night into the Eastern US. The speed also gives a rather distinctive cadence to an idling signal.

Daytime frequency for RFFX, the routing indicator used by the station at Versailles, Paris, is 13572.5 kHz with that station dropping to 8105 kHz during the evening and even lower to 6955 kHz in event of poor conditions. Excellent daytime propagation may see the station moving even higher to 18214 kHz, but those conditions are rare with the current state of the sunspot cycle. Usual destination for this link is RFFXL, the station in Naqoura, Lebanon, which can often be heard sending on 10626 kHz.

The station idles most of the time but the occasional "controle de voie" test message and sometimes 5-letter group off-line encrypted traffic is passed to other stations. Hoka decoders have an automatic setting for this unusual speed and most other decoders can have their speed set manually.

❖ Algerian Construction ALE Network

The French road construction company Colas SA's local subsidiary recently won a contract to build Algeria's new East-West highway connecting Morocco, Tunisia, and Algeria, in addition to a number of important cities along the way. Their operations can now be heard on HF on 5378 and 8061 kHz. Doubtless there are more frequencies to find. The identifiers used so far include:

COLASCOLAS4	HQ
BISKRACOLAS4	Biskra
DJANETCOLAS4	Djanet
ELOUEDCOLAS4	El Oued
ILLIZACOLAS4	Illizi
MOBRRTCOLAS4	Mobile

❖ Mystery ALE Networks

A new network with interesting call structure has also appeared recently. Frequencies used are 5254, 7740, 8565, 8980, 11407 and 12806 kHz USB.

Identifiers are made up of Letter-Letter-30LP90 and include the following:

FU30LP90
LP30LP90
LP90LP90
RK30LP90
TS30LP90

Propagation suggests an Eastern European or African location.

Another unidentified network has recently appeared on 8037 and 9119.5 kHz USB. This one is almost certainly in the US and features the identifiers:

AFF
CSM
EMP
FNK
ONK
RMD
RVA
SUF

That's all for this month; until next time, enjoy the digital DX.

Missionaries on the March in Micronesia

Last year we uncovered plans by Pacific Missionary Aviation for a shortwave station in Pohnpei, Federated States of Micronesia. It was discovered on the air at the beginning of March, picked up first by Japanese DXer H. Yokoi and then by Sei-ichi Hasegawa of the Nagoya DX Circle. It was heard as early as 0830 and as late as 1300 varying slightly from 4755.16 to 4755.17, with music and IDs in English mentioning FM 88.5 and 4755. This represents a new radio country on the SW broadcast bands.

Takahito Akabayashi, Tokyo, adds in *DX Listening Digest*: The transmitter seemed to be in adjustment, the signal sometimes interrupted, and modulation level low. PMA is a Christian evangelical organization serving Guam, Micronesia, and the Philippines, established in 1956. According to their web page **www.pmapacific.org/projects/radio_station.php** the address is P. O. Box 517, Pohnpei, FM 96941, but they recommend all correspondence should be addressed to PMA Guam, P. O. Box 3209, Hagata, Guam 96932.

PMA informed *DXing.info* that regular broadcasts should begin by the end of March. PMA was surprised by many reception reports from Japan, since it was only meant to cover Micronesia and the Marshall Islands. They said the power is 500 watts. Most transmissions will be in English, but also local languages will be used. E-mail: *radio@pmapacific.org* This from Roland Weibel at the station, who referred to the updated website **http://radio.pmapacific.org** for more info, including some photos of the facility.

PMA is involved with Galcom, which specializes in manufacturing fix-tuned radios for missionary stations such as this to hand out so listeners cannot tune in any other station on them, rather like North Korea.

Takahito Akabayashi found the facility described as 1000 W with a quarter-wave vertical antenna. Ron Howard found another item on the website saying they were covering a radius of 500 to 1000 miles. The studio in a converted 40-foot refrigeration container and antenna are in the village of Ninseitamw, Kolonia, on the island of Pohnpei, FSM at 06° 57' 56.7" N, 158° 12' 17.3" E, more or less.

"Tests started on Monday, Feb. 26, 2007, and will last until we get the official license from the Dept. of Communication, Government of the Federated States of Micronesia. Please subscribe to the newsletter to be informed when the radio station has a name, is licensed officially and on air permanently."

It's in the UT +11 timezone, so local night hours, when 60m DX propagation would be possible, are roughly 07 to 19 UT. Indonesia on 4750 could be an interference problem in Micronesia, but there is not much else on 4755, except a Brazilian on 4755.4 which might be on the air in the early morning, R. Imaculada Conceição, so be careful. It turned out the tests were only heard on March 1, 2 and 3, says S. Hasegawa; then nothing reported for the next two weeks, and at press time no reports yet from North America.

. . . And Central African Republic

WRTH 2007 on page 153 mentioned a Future Plan for "R. Tuma Yere at Boali on 6030 kHz, 1 kW in French, Sango, Aka and Yulbe." An HCJB press release via Bruce Atchison and Alokesh Gupta, *DXLD*, reported that it began broadcasting March 1 with an antenna "almost the size of a football field." As in American football, or as in soccer? Surely the latter would be more apt in the CAR. This must refer to the "lazy H" NVIS antenna, which HCJB engineers have been pushing and installing at various other remote missionary stations, the anti-DX design which maximizes vertical incidence and minimizes low-angle radiation suitable for long-distance reception. Nevertheless, some DXers will eventually pull it in, no doubt.

A *WRTH Online* update reported: initially operating M-F at 0500-0800 and 1600-2000 as Radio ICDI (Integrated Community Development International) until another name is chosen. Address: B. P. 362, Bangui Web: **www.icdinternational.org/radio.html** E-mail: radioicdi@gmail.com L.P.: Josue Mbami, Mgr.

If I were picking a frequency for my new station, 6030 would be close to my last choice, with megawatts of dentroCuban jamming and R. Martí on it for much of the day – unless I could be sure those would not be propagating when I'm on the air.

At press time no DX reports of it had reached us; our best chance should be at *0500 Mondays, when Martí and Cuban jammers are taking their weekly rest period, but all we heard then was CFVP in Calgary along with stronger signals on 6025 and 6035. In European evenings, BBC via Oman 6030 at 1630-2100 was and is the problem, and should also disrupt reception in the local area.

DXing.info adds: the first test transmission was on February 22, but official broadcasts began March 1. Radio ICDI makes Christian broadcasts and community health information available to most of the country's 3.5 million people, many of whom live in remote and isolated areas. This is the country's first privately owned shortwave station.

AFGHANISTAN [non] R. Solh, 15265, plays some great music which we often listened to until 1500* But there is a lot of repetition; must have a limited library. One song we heard over and over every day at exactly the same time, 1451-1457 UT. It had a rapid and increasing beat, with clapping and shouting, refrain played on an accordion-like instrument, the performers obviously having a great time. It reminds us of an Irish reel. Olle Alm suspects that the entire broadcast replays the same recordings every day. That sure must cut down on production, and feed costs. All they have to do is respin the same CD at Rampisham, UK (gh, OK) Sort of a celebration with people forming a circle while applauding. Not a bad song and their music is what could get our attention, from a language we barely understand (Raúl Saavedra, Costa Rica, *DXLD*) A-07 schedule is 1200-1800 on 17700 instead; check if they are still playing it months later (gh)

ALBANIA R. Tirana A-07 English: Eu 1845-1900 6035, 7465; 2000-2030 7465; NAm 0145-0200 & 0230-0300 6115, 7425 (Drita Çiço, R. Tirana, *DXLD*)

AUSTRALIA Nigel Holmes, Radio Australia head of transmission, explains why ABC NT transmitters on the 60 and 120 m bands keep breaking down. The heat is usually 45 degrees C; that's over 100 F. It's hot for

weeks on end. The newly commissioned transmitters have trouble standing up to the heat of Australia's outback. The longest on-air trouble-free period is less than a few weeks. Components can take up to 60 degree heat, but not for days on end above 45 (John Wright, Australian Radio DX Club, *DXLD*)

AUSTRIA David Hermges, long-time head of the shortwave service of the Austrian Radio and Radio Austria International, died in Vienna in March following a lengthy illness. He was 78. Born in England in 1928, he came to Austria after the war and was based in Carinthia. His voice was known to generations of listeners at home and abroad from his English news bulletins on the first program of ORF, his announcements for all broadcasts from the Salzburg Festival and ORF's *Report from Austria* (ORF via Hubert Kubiak and via Herbert Meixner, Austria, A-DX via Wolfgang Büschel, *DXLD*)

Many SWLs will remember David from his many years as producer/presenter of *Austrian Shortwave Panorama*. He always gave great encouragement to younger people launching a career in broadcasting – which in the 1970s included a young Jonathan Marks, who spent some time at Austrian Radio before starting his career at Radio Netherlands (Andy Sennitt, *Media Network*) I also contributed to *SW Panorama* for a number of years (gh)

BOLIVIA New on 4728.2 is Radio Aripalca, in

Aripalca, Municipio de Vitichi, Provincia Nor Chichas, Depto. Potosí, heard at 1038 with music, ID, relaying news from ATB TV network.

New frequency 3215, for R. Virgen de Remedios, at 0010 relaying WEWN with QRM from WWCR; also at 1040 with WEWN, 1100 ID (Rogildo Aragão, Quillacollo, Bolivia, *HCDX*)

BRAZIL Rádio Cultura, Araraquara, reactivated in mid-Feb on 3365, heard at 0215 with regional songs, ID, good signal (Rudolf Grimm, São Paulo, *World of Radio*) Had not been reported for about 6 months (gh)

BULGARIA R. Bulgaria, A-07 English: WEu 0630-0700 9600 11600; 1130-1200 11700 15700; 1730-1800 5900 9600; 2100-2200 5900 9700; NAm 2300-2400 & 0200-0300 9700 11700 (via Hector Frias, Chile, and Dmitriy Kutuzov, Russia, *DXLD*) Will add six daily semihours in Arabic from July 1. And R. Varna A-07: 2100 Sun to 0300 Mon, 100 kW non-directional on 9900 (Wolfgang Büschel, *DXLD*)

CANADA In late Feb, time-signal station CHU changed its announcements every minute to say it had been licensed to remain on 7335; from April 1 that is officially in an SWBC band extending to 7350, rather than utility. Now maybe Vatican and other broadcasters colliding on 7335 will have to notice CHU (gh)

CHINA [and non] Sound of Hope and jammers on partly revised frequencies: 9200, 10200, 13970, 14600 and 17330. Actual SOH program heard on 10200, 14600 and 17330, on the others only Firedrake. Always when I have heard SOH they have had talk only, without any music, so that seems to be the way to distinguish them: Talk = SOH, music = jamming (Olle Alm, Sweden, *DXLD*)

COLOMBIA Radio Líder returned to the air March 10 on 6139.8, and was heard with a good signal for the next few nights, as early as 2325 and as late at 0940 with LA songs, many IDs (Manuel Méndez, Spain, *DXLD*) Also good here around 0500. But for how long? Previous active periods lasted less than a week, then silent for months (gh)

CONGO DR On 5066.337, Radio Candip, Bunia, at 0405 with chatter mentioning Bunia. Mainly poor with a few fair peaks; drifted to 5066.332 by 0420. Very pleased with this one (Brandon Jordan, AL, *World of Radio*) Apparently in skip zone of WWCR 5070 (gh)

CUBA [non] R. República via RMI, A-07: via Sackville 0100-0400 UT Tue-Sat on 9735, instead of one hour later on 9630 in B-06; CBC says 9630 is OK in winter because CBC 9625 is too high to give good service anyway to northern Canada. Via T-Systems: M-F 2300-0400 UT Tue-Sat on 5910 from Wertachtal. On WRMI 9955 itself, R. República as of March was operating daily 0500-0700, 1600-2100; UT Sun/Mon 0200-0400 (Jeff White, RMI, *DXLD*)

DOMINICAN REPUBLIC Rudolfo "Rudy" Espinal, one of our most favorite SW hosts of years gone by on R. Clarín, was spotted in a *Diaro Libre* newspaper photo this January, identified as director of Turinformativo, Caribbean Traveling Network (Clara Listensprechen, *DXLD*)

ETHIOPIA [non] Voice of Oromia Independence, A-07 via T-Systems, Jülich, Germany: 1700-1730 Saturdays on 15650 (Jeff White, Radio Miami Internatiional, *DXLD*)

Andenet LeDemocracy Radio, clandestine, (via Samara, Russia), 9445, heard Sunday from *1600, flute, partial ID in Amharic. Web-site at **http://www.andenet.com/** supposedly includes audio stream. Says it started broadcasts Feb 9, 2007. Voice of Andenet is a branch of KINIJIT Support Group in the US established in May 2005. Kinijit is a party dedicated to bring unity, peace, and prosperity to the citizens of Ethiopia through the democratic process. Derived from the merging of All Ethiopian Unity Party (AEUP), United Ethiopian Democratic Party-Medhin (UEDP-Medhin), Kestedamena and Ethiopian Democratic League, according to party-web **www.kinijit.org/** (Finn Krone, Denmark, *BCDX*)

GERMANY Although DW's program schedule has been revamped, changes are not as drastic as feared last month. The first half of most hours includes *News* and *Newslink* updated more frequently, and occasionally occupying a full hour; otherwise feature programs continue during the second half hour, including *A World of Music*. But since many SW broadcasts have been cut to half an hour, you may have to get the features by other means such as on demand from website. A mailbag program is now called *In-Box*, for 20 minutes starting at :15 past certain hours on Sundays, and no more *DX Meeting*. Thanks to Rich Cuff for the update (gh)

Of course, no SW broadcasts are aimed at North America any more, so we recommend these in the A-07 schedule from Rwanda toward West Africa at 295 degrees, and luckily also onward toward us: 0400-0457 7245, 0500-0530 9700, 0600-0630 15275, 2100-2157 15205, 11865. The same last two frequencies at 2000-2057 are aimed southeast from Rampisham UK, so also ought to be audible here off the back (via Joe Hanlon, *DXLD*)

The new schedule runs until April 30, when the last of DW's transmitting stations, the Nauen site which veteran DXers recall was used by Radio Berlin International for many years, will end transmissions. From May 1 the Nauen frequencies will be replaced with more usage from VT sites, such as those in the UK and other VT-owned facilities (Joe Hanlon, NJ, *DXLD*; Wolfgang Bueschel, World DX Club *Contact*) More usage of UK sites, Ascension, Portugal, Rwanda may actually improve our access to DW, incidentally (gh)

GREECE After a sesquimonth of constant carrier and/or modulation dropouts on the experimental V. of Greece relays via SVO, Olympia Radio, this problem appeared to have been solved by mid-March, 11645 running without breaks (Wolfgang Büschel, *DXLD*) Likewise 15630 when it was via SVO instead of Avlis; but unknown whether the SVO relays would continue in A-07, not on VOG's own schedule (gh)

GUINEA When strife broke out here in early Feb, there was no SW to be heard, 7125 having been silent for at least six months (Chris Greenway, UK, *DXLD*) Conakry, 7125 noted again Feb 24, in the clear after 1957; with Afropops in French, 2021 "Radio Nationale" ID, 2030 urgent-sounding monologue in

vernacular. Speechifying didn't end until 2111 (Al Quaglieri, NY, *DXLD*) Then widely heard until 2400*, overlapping with Russian tune-up tones just before the hour, and also from *0600, tho RN Flevo had been using 7125 at 0700-0757 only; sometimes one on top, sometimes the other. In A-07 RN planned to use 7125 only during a local evening hour instead (gh, OK)

HUNGARY A reorganization of Regional and Minorities programs at Hungarian Radio has merged the External Service with the new channel MR4. Radio Budapest, the External Service, is phasing out the use of freelance staff. All freelance contracts were terminated on 28 February, leading to immediate closure of the Italian service (Italradio.org via *Media Network*) Rumors say R. Budapest may close down in a few months. SW, budget granted by Hungarian Parliament, may stay alive but only relaying domestic services to Hungarian abroad (Luigi Cobisi, DSWCI *DX Window*)

Meanwhile Italian was still on the A-07 schedule, just playing music. English, while it lasts: Eu Sun 1500-1530 6025 9610; the rest daily: 1900-1930 3975 6025; 2100-2130 6025 9525; NAm 0100-0130 6040; 0230-0300 6195 (via Csaba Banky via Paul Gager, Austria, *BDXC-UK*)

INDIA AIR Guwahati, nominal 4940, appeared frequently in February and March on 4900 instead at times such as 0045-0145, 1159, 1344 (Gautam Sharma, India, via Alokesh Gupta, *dx_india*)

INDONESIA V. of Indonesia had been using 9526 for external broadcasts, or sometimes 15150, but in mid-Feb started using 11785v instead such as 11784.866, at 1600 in Arabic, then European languages including English at 2000-2100 (Wolfgang Büschel, Germany, *DXLD*) Unreliable; some days Spanish at 1700 was missing; or when on was playing news programs one or two months old (José Miguel Romero, Spain, *ibid.*)

IRELAND [non] RTE found itself back on SW in Feb, without really trying, since WRMI decided to resume broadcasting World Radio Network on 7385 M-F at 2200-0200 Tue-Sat, and RTE happened to occupy the first semihour of that block; with DST March 12, this changed to 2100-2130, although antenna problems weakened WRMI's signal (gh)

KOREA NORTH VOK is becoming a reliable QSLer in North America after many years of poor mail service between the USA and North Korea. The mail now goes through on a regular basis, which is good for the verification business (Richard A. D'Angelo, PA, NASWA *Journal*)

LIBYA [non?] V. of Africa continued to be heard on 17725 around 1500 in English, but sounding different in early Feb; no more big hum, but low modulation (gh) Transmissions formerly via Issoudun, France, have been transferred to Libya (*WRTH* Feb Update, via Noel Green)

Monitored schedule in March of Voice of Africa. Erratic engineering indicates these come from within Libya, at least not from a professional site. Propagation characteristics also indicate a distant site. The sign-on and -off times given are rounded off. Exact times are up to the will of God (or whoever is in control in Libya).

1200-1400 21695 17725	Swahili
1400-1600 21695 17725	English
1600-1700 15660 15220	French
1700-1800 11965 11860	French
1800-2000 11965 9885	Hausa

No relays via TDF France heard except for the jamming of Sawt al-Amal (Olle Alm, Sweden, *World of Radio*) Shouldn't one expect, taking into account "involvement" in the Moyabi transmitting complex that Libya announced, that V. of Africa would also perhaps be carried via ANU transmitters in Gabon? (Bernd Trutenau, Lithuania, *ibid.*)

In late Feb, Sawt al-Amal, clandestine for Libya via Moldova, started using frequencies between the standard channels, jumping around during the 12-14 UT broadcast, such as 17622.5 to 17627.5 to 17637.5. The Libyan bubble jammer could only tune in full kHz steps, so caused a 500 Hz beat with Amal. Later it adapted to the .5 channels. The TDF jammers were barely audible due to poor propagation, but seemed to park on the 5 kHz channels adjacent to each side of Amal (Olle Alm, Sweden, *DXLD*)

MALDIVE ISLANDS [non] Minivan Radio A-07: 1600-1700 daily on 11725 from T-Systems, Jülich, Germany (Jeff White, RMI, *DXLD*)

MÉXICO The revived XEYU, R. Universidad Nacional, remained active in Feb on 9599.3v, once with an amazing S9+20 signal in the middle of the night at 0730, but disappeared in early March (gh, OK) Engineer Mejía tells me the transmitter broke down and they were working on repairing it as soon as possible (Julián Santiago Díez de Bonilla, DF, *condig list*)

MYANMAR Got a QSL from Myanmar, after at least 25 years of reports! Decided to send this one out Registered Mail with Return Receipt, and included some Myanmar stamps (had to get them from a dealer in Thailand!), 3 IRCs, $1.00 and a Harpers Ferry postcard, and reports from two separate days. 5 weeks later, I got the return receipt back and the next day a letter from U Ko Ko Htway, verie signer for Myanma Radio. He seems to take pride in verifying reports, included a very nice multi-color folder-card, and a personal letter. He said it was the first time he had received my letter, and he always replies to listeners (Alex Vranes, Jr., WV, *DXLD*)

NETHERLANDS [non] RN A-07 English to NAm at 00-02 moved from 6165 Bonaire to 9845 Bonaire, while 6165 switched to Sines, Portugal relay for the first time, in Spanish at 0000-0400. Then 6165 back to Bonaire for English at 04-05 (via José Bueno, Spain, and gh)

NICARAGUA R. Chontaleña, the 1070 harmonic heard on 2140 in the morning, mentioned two months ago, also heard signing off early at 2359 (Harold Frodge, MI, *MARE Tipsheet*)

NIGERIA [non] New clandestine brokered by TDP is Radio Saa, in Hausa at 1600-1700 Wed & Sat on 15180, 500 kW, 185 degrees via Issoudun, France; first broadcast was only music (*DX Mix News*, Bulgaria) The next one had Hausa announcement, African songs (Anker Petersen, Denmark, *@titivade DX*)

PAKISTAN If you want a QSL card from Radio Pakistan, write to this address: Radio

Pakistan, 303 Peshawar Road, Rawalpindi, Pakistan, (different from *WRTH*-2007, *PWBR*). (Alican Yasar, *HCDX*)

PERÚ Less than two weeks after the report quoted last month that R. La Hora, Cusco, would be off the air for 2-3 months, it was already back, per Carlos Gamarra, frequency director, Mon-Sat at 1000-1600 and 2200-2400. Also R. Universal would shortly return on 49m; both had damage from electrical discharges (via Dario Monferini, Italy, *DXLD*) WRTH 07 lists the latter on 6090 in Santa Mónica, Cusco; rarely reported (gh) R. La Hora heard on 4856.43 at 1100 (Chuck Bolland FL, *DXLD*) And at 2325 with sports (Rogildo Aragão, Bolivia, *HCDX*)

ROMANIA RRI heard in English at 0440 on 3400, a very weak mixing spur of 9515 minus 6115 at same time, both good (Nick Rank, Derbyshire, *BDXC-UK*)

SA'UDI ARABIA In almost daily checks of the Afropop music distraction from Gabon on 17660, I began to hear another station underneath from about 1450. Eventually this could be identified as BSKSA's French service, ex-21600. It was in the clear after 1531 with news, until 1600 when blocked by WYFR in Portuguese via Ascension (gh, OK) BSKSA went into English at 1600 (Noel Green, UK, *DXLD*) On some days reception in English held up past 1700 when in the clear again, and even past 1830 when WYFR came back on. So BSKSA English is on 17660 from 1600 to 1900. After 1700 heard with features on technology; children (Bernie O'Shea, Ont., *ibid.*)

A new schedule also shows English at 0900-1200 on 15250, 15470 (Wolfgang Büschel, Germany, *ibid.*) Really monitored only on 15250 at 1000-1155, and the first hour blocked by China (Noel Green, UK, Erik Køie, Denmark, *ibid.*) At 1043 one day talking about hair care, especially by females (Manikant Lodaya, India, *ibid.*)

In December 2005, the Sa'udi English language newspaper and website *Arab News* published an article about the English Service, in which the head of the service, Hanan Awad, said that they wanted to be on shortwave so they can be heard all over the world and they had been promised that this would be considered (Andy Sennitt, *Media Network* blog)

SERBIA International Radio Serbia announced on its website **http://www.radioyu.org/KT_eng.htm** that it would extend its programs from March 5, to improve reception in Europe, at least during daylight, starting with English at 1400-1430 (Dragan Lekic, Serbia, *DXLD*)

Never audible here before or after this date, only DRM from Luxembourg spreading 6087 to 6103 (Wolfgang Büschel, Germany, *ibid.*) No trace here in south Italy (Roberto Scaglione, Sicily, *ibid.*)

Serbia interval signal clearly heard at 1929 using upper sideband, virtually clear of DRM splash from 6095, fair signal but under very strong China Radio International in Russian. Believe language was English (Mike Barraclough, UK, *World of Radio*) Is this really 250 kW from Bijeljina, Bosnia? (Wolfgang Büschel, *DXLD*) No, I found out that it is a low-power mobile 10 kW transmitter near Beograd; Bijeljina to resume in June (Lekic, *ibid.*)

Besides DRM from 6095, other collisions on 6100 were: 1430-1530 India; 1700-2200 CRI; 1830-1930 & 2030-2130 Iran (*DX Mix News*, Bulgaria)

SPAIN REE's A-07 schedule shows English: Eu M-F 2000-2100 9665 50 degrees, but Sat/Sun 2100-2200 9840 38 degrees; CAf M-F 2000-2100, Sat/Sun 2100-2200 all on 11625 161 degrees. NAm daily 0000-0100 6055 290 degrees (via José Bueno, *Noticias DX*)

For the past few years, REE had insisted on moving the 0000 transmission to 15385 by April, when it seldom propagates. The shift to 2100 on weekends is to avoid live sports coverage in Spanish on other frequencies, which still sometimes runs over, pre-empting English.

The sked also shows a special broadcast to Spanish UN peacekeeping forces in Lebanon on 15345, M-F 1800-2200, Sat 1700-2200, Sun 1400-2200. In the B-06 season this was on 12045 until 2300, and surprisingly well heard in CNAm. Unfortunately, 15345 collides with Argentina's European service, which has been there for sesquidecades and which already collides with Morocco, neither of which participates in HFCC! (gh)

The new sked still shows German Mon & Thu 1730-1800 on 9665, but this was canceled in August 2004; it's dead and gone! (Wolfgang Büschel and Kai Ludwig, Germany, *DXLD*)

SWEDEN [and non] Radio Sweden English A07, to NAm: 1230-1300 15240, 1330-1400 15240 Sackville; 0130-0200 & 0230-0300 6010 Sackville. 1230 also to Eu/Af/ME/As/Pac on 15735, 13580; 1330 15735. 0130 also to As/Pac on 11675 Madagascar; 2130 Eu 6065, Au 7420 via Madagascar. More details at: **http://RadioSweden.org** (via Alokesh Gupta, *DXLD*)

SYRIA R. Damascus now has a website: **http://cobaq10.iespana.es/damasco/** (Geovanny Aguilar Bustamante, Honduras, *condig* list) Only in Spanish initially (gh)

TURKEY VOT A-07 English:
    1230-1325 Eu 15450, Au/As 13685 [but try both in NAm]
    1830-1925 Eu 9785
    2030-2125 Au/As 7170
    2200-2300 Eu/NAm 6195
    0300-0400 Eu/NAm 5975, As/Af 7270
    (via Joe Hanlon, *DXLD*)
    Live from Turkey, the worldwide phone-in hardly anybody calls, is on Tue at 1850 and Thu at 1250; also webcast (gh)

U K Frustrated by government jamming and dwindling audience figures, staff at the BBC's China service are worried about an increasingly uncertain future. Reductions in staff of 37 journalists at Bush House were planned. Staff members said

the cuts would be fiercely resisted, with a "Save the Chinese Service" petition (*Media Guardian* via *Media Network*) Since BBC WS is taxpayer-financed, it is essential that all languages are continuously reviewed for effectiveness. The mobile and satellite TV market in China is huge compared to the microscopic SW market (Jonathan Marks, *Media Network* blog)

[non] BBC Mundo, Spanish website announced in mid-Feb that it would broadcast at 11-12 to Cuba and Caribbean on 13870, 13570, 6300 and 5100 kHz (via José Bueno, Spain, *playdx*) This was nonsense and still not corrected a month later (gh) Actually heard on 13760 (Noel Green, UK, Raul Saavedra, Costa Rica, *DXLD*) And from nearby on 6095 (Chuck Bolland, FL, *ibid.*) Sites? Both probably changed for A-07 (gh)

U S A At a time when the Bush administration is fighting a war to promote democracy in the world, the White House-appointed Broadcasting Board of Governors voted to reduce funding for government broadcasts to Tibet by more than 20% and the number of broadcasting hours by 50%, leaving Tibetans to rely increasingly on official Chinese radio (William Triplett, *Variety*, via kimandrewelliott.com)

To sign "Save VOA Programs to Russia and Other Media-at-Risk Countries Petition" go to: **www.petitiononline.com/tl1122/petition.html** (FreeMediaOnline.org via Zacharias Liangas, *DXLD*)

Eleven former directors of the Voice of America have issued a joint statement calling on Congress to reverse a Bush administration plan to substantially reduce VOA's English broadcasts and those in 15 other languages. Signed by: Mary G. F. Bitterman, Robert E. Button, Richard W. Carlson, Geoffrey Cowan, John Hughes, David Jackson, Henry Loomis, E. Eugene Pell, Robert Reilly, R. Peter Straus, and Sanford J. Ungar (via Rachel Baughn)

The Broadcasting Board of Governors wants to eliminate a total of 197 positions through the FY 2008 budget request process. 153 of those positions would come from the Voice of America. It is up to all of us to alert Congress as to the stupidity of these proposed cuts. The Board continues to make colossal errors in judgment. What the Board is really doing is getting rid of long-term radio people, to replace them in some languages with TV. According to the government's latest Human Capital Survey, morale at BBG is among the lowest of any agency (AFGE Local 1812)

James Glassman, television pundit, American Enterprise Institute scholar, former editor of *Roll Call*, former *Washington Post* columnist and author of books including "Dow 36,000: The New Strategy for Profiting From the Coming Rise in the Stock Market", is said to be getting the job of chairman of the Broadcasting Board of Governors, a part-time – but time-consuming – gig overseeing the Voice of America, Radio Free Europe, Radio Free Asia, Middle East services (Al Kamen, *Washington Post*, via Mike Cooper, *DXLD*)

Greenville VOA Site A (nearest Williamston, NC) is now defunct. The transmitters and antennas are being "cannibalized" to support Site B. Site B hasn't too many years to survive, either. Millions of US$, wasted (Charles Taylor, Greenville, *shortwavesites yg*)

For a few nights in late Feb, VOA Spanish inexplicably appeared on 6100 at 0100-0200, colliding with RCI's Spanish broadcast (Mark Taylor, WI, *DXLD*) VOA was supposed to be only on 9480, 9885, 11840 (gh)

KAIJ's program schedule: see **http://24.151.207.180/k/kaij/pages/programs.php**

In March, *World of Radio* was scheduled Thu 1500 on 9480, Fri 1030 on 5755. *Ted Randall Interviews*, Fri 0900 on 5755, 1500 on 9480 (gh)

Despite almost constant strong RTTY on 7455, which dissuaded other US or European broadcast stations from using it, WYFR inexplicably went there in B-06, at 0700-1045. Even more incredibly, despite the RTTY and WYFR, WEWN in Spanish also moved to 7455 on February 20, all the way from 2300 to 1300, replacing what had been a clear frequency for them, 7540. We checked on a number of occasions after 0700; at our location sometimes WYFR, aimed right at us, would dominate; other times WEWN, aimed at Central America. Protestants vs Catholics! Only with the start of A-07 March 25 would WYFR quit 7455. US broadcast stations are allowed above 7350 only on a non-interference basis, but the victim has to complain. What listeners encounter really matters not, broadcasters pick frequencies without bothering to monitor what is already on them, and the FCC doesn't warn them about impending collisions (gh, OK)

The situation may well have changed by now, but as of March, WRMI was carrying World Radio Network on 7385 M-F at 2100-0100 Tue-Sat, starting with Ireland [q.v.]; the morning block would shrink from 1300-1600 to 1400-1600 as of March 25, still containing mostly DX programs in English and Spanish. R. Prague relays, daily but one day late: 0900 English 9955, 0930 Spanish 9955, 1400 English 7385, 0430 Spanish 9955. Radio República on 9955: daily 0500-0700, 1600-2100; UT Sun/Mon 0200-0400. See also CUBA [non] (gh)

[and non] Former WRNO broadcaster and Nazi Holocaust denier Ernst Zundel, after having been deported from Canada, was convicted by a German court on 14 counts of incitement of racial hatred and sentenced to five years in prison (CBC News via Fred Waterer, *DXLD*)

WESTERN SAHARA [non] After missing almost a month, Radio Nacional de la República Árabe Saharaui Democrática, via Algeria, reappeared March 6 on 6300 (Wolfgang Büschel, Germany, *DXLD*) The usual Arabic broadcasts from 1700 to 2300, and 0700-0900 or so, Spanish at 2300-2400. This time they stayed on the same frequency for at least a week! (gh) Very strong here after 2300 (Bernie O'Shea, Ontario, *DXLD*)

Until the Next, Best of DX and 73 de Glenn!

BROADCAST LOGS

NOTEWORTHY LOGS FROM OUR READERS

Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com
http://mt-shortwave.blogspot.com

0215 UTC on 4780
GUATEMALA: Radio Cultural Coatan (tentative). Spanish musical variety of slow music tunes. Brief religious program spots at 0227 and mentions of local campesinos at 0242. SIO 322 with swiper interference observed (Harold Frodge, Midland, MI).

0241 UTC on 9680
UNITED KINGDOM: BBCWS. Report on Chinese holiday seasons (Howard Moser, Lincolnshire, IL). **BBCWS (Cyprus)** 9410, 0618-0649 *World Today* program (Joe Wood, Greenback, TN). **BBCWS (USA)** 11675, 2115 (Moser). **BBCWS (Ascension Island)** 15400, 1645 (Mike Branco, Islip, NY).

0402 UTC on 4780
DJIBOUTI: Radio Djibouti. Vernacular news bulletin from male/female duo, SINPO 24332 (Arnaldo Slaen, Buenos Aires, Argentina).

0409 UTC on 5915
ZAMBIA: ZNBC. Local music vocals to vernacular language announcements. "Zambia Broadcasting Corporation" ID, followed by talk segment and music. Good signal observed (John Wilkins, Wheat Ridge, CO).

0457 UTC on 6280
ISRAEL: Kol Israel. French newscast with good signal (Wood). French news 6985, 2036-2046+; Hebrew 7545, 2055 // 6985. Israel's **Galei Zahal** 6972. 61 in local languages to pop music, SIO 242 (Frodge).

0506 UTC on 3810
ECUADOR: HD2IOA (Time/Freq station) Good signal for Spanish time recordings, minus tone shift at minute marks. Ecuador's **HCJB** 9740, Dutch 0640 (Wood). **HCJB** 9780, 0247; 0300-0305; 12040, 2337-2342 German (Slaen).

0507 UTC on 4777
GABON: RTV Gabonaise. French newscast and taped speeches. Signal observed from 4770-4780 kHz; 0514-0532; 0518-0533 (Wood). Gabon's **Afrique Numero Un** 17630, 1605. Music to 1630, followed by sign-off routine of ID and interval signal (Brano). 9580, 0605-0610 (Wood).

0511 UTC on 6055
SPAIN: REE. Spanish text to Spanish folk tunes program (Wood). 6055, 0543-0556 (Moser). 9680, 2041-2146+ music lesson to *Espanol by Radio*. SIO 343 (Frodge).

0512 UTC on 9685
SOUTH AFRICA: Channel Africa. News about Malawi and Uganda, followed by program *Thirty Seven Degrees* of fair signal quality (Wood). 7390, 0315-0356* *Beat It* program // 3345 (Dave Valko, PA/Cumbre DX).

0527 UTC on 9885
MOROCCO: VOA relay. Programs *Today in History* and *One World* of good signal quality. VOA Sao Tomé relay 6080, 0615 (Wood). Morocco's **RTV Marocaine** 15345, 1700 (Moser).

0605 UTC on 4885
BRAZIL: Radio Clube do Para. Portuguese station ID/frequency quote to dance tune *I Will Survive* (Wood). Brazilians monitored: **Radio Rio Mar** 9694.92, 1002-1007 (Slaen; Wood). **Radio Nacional da Amazonia** 11780, 2259-0001 (Wilkins).

1117 UTC on 3385
PAPUA NEW GUINEA: Radio East New Britain. Rapid text religious preaching closing with singing and mentions of program's name *Message of Hope*. **Radio Manus (Admiralty Islands)** 3315, 1207. **Radio East Sepik** 3335, 1139-1155 (Valko). PNG stations logged in vernacular languages from 1000 UTC: **Radio West New Britain** 3235; **Radio Madang** 3260; **Radio Southern Highlands** 3275; **Radio Manus** 3315; **Radio North Solomons** 3325; **Radio New Ireland** 3905 (Slaen).

1220 UTC on 9500
UZBEKISTAN: Christian Vision (Tashkent relay) Male/female Hindi text to English identification "CVC The Voice," plus India address. Hindi/English mix reports to slow pop music amid moderate signal quality (Jim Evans, Germantown, TN).

1228 UTC on 7270
CHINA: PBS Nei Menggu (presumed). Mongolian. Fair signal quality for talk and traditional music, // 9750 with NHK Japan interference (Ron Howard, Monterey, CA). China's **Sichuan PBS-2** Chengdu, Sichuan 6060, 1910-1020 Tibetan (tentative) (Slaen).

1236 UTC on 9526
INDONESIA: Voice of Indonesia (Cimanggis) Indonesian. Regional music to station ID and English station address. Service should have been Korean, but sounded more Bhasa. Moderate signal SINPO 34333 (Evans). **RRI-Fak Fak** 4789.98, 1331-1400*; **RRI-Makassar** 4749.96, 1345-1402*. **RRI-Kendari** 3995.04, 1407-1434 (Valko).

1248 UTC on 6140
RUSSIA: Voice of Russia via Chita (Atamanovka) Checking for reported activity on this frequency, and found VOR in Vietnamese. Pop music, interval signal at sign-off for poor signal (Howard). **Radiostancia Tikhy Okean** 7330, 0938-0945 // 5960 Russian (Slaen).

1320 UTC on 9570
CUBA: China Radio Int'l relay. Great signal for segment on reunification of Taiwan. **Radio Havana** 11760 //9505 at 2055 (Bob Fraser, Belfast, ME). Spanish 9600, 0559 (Wood).

1330 UTC on 9580
AUSTRALIA: Radio Australia. *Top Twenty Country Music* // 9590 with good signals (Fraser). 17785, 2203 world news and Queensland rains reliving drought (Moser). 17795, 2345 news on the Boreno rain forest // 17785, 17750 (MacKenzie). 15515, 0439-0444 (Wood).

1345 UTC on 6080
SINGAPORE: Radio Singapore Int'l. News updates to closing announcements at 1358 and mention of 6150 to replace 6080 kHz with Mediacorp Radio. Signal close at 1359. Freq 6150 noted with co-channel Chinese station (Wilkins).

1400 UTC on 4749.96
CLANDESTINE: Open Radio for North Korea. Opening Korean announcements to 1420. Music mix of Abba's *Waterloo* and Don Mac Lean's *Vincent*. Good signal observed from presumed Novosibirsk site. Station off at 1500 UTC, leaving an unidentified station on frequency. No idea of station, since band is on the way out by 1500 at this longitude (Wilkins). **WADR-West African Democracy Radio** 17860, 0950-0955 (Slaen).

1515 UTC on 9599.3
MEXICO: Radio UNAM. Operatic vocals to 1601 program announcement, but no identification noted. Orchestral music program at 1602 amid fair signal quality despite fading (Wilkins). 1356-1404 (Valko).

1703 UTC on 11690
JORDAN: Radio Jordan. Middle East news topics at tune-in. Weather update to SW/FM identification and pop music program. Noted good on signal peaks (Wilkins).

1915 UTC on 15476
ANTARTICA: Radio Nacional Arcángel San Gabriel. Spanish. Talk about dogs present in the Antarctic territory, followed by Argentine folk songs. Station ID "Esperanza al Mundo por Radio San Gabriel." Interesting program on the history of Antartica. Station identification as, "desde la Base Esperanza, Territorio Antartico Argentino, transmite LRA36 Radio Nacional Arcángel San Gabriel, en español, de lunes a viernes para todo el mundo." Additional mention as, "quedese hasta las 18 horas en Radio Arcangel San Gabriel." (Slaen).

2016 UTC on 9385
USA: WWRB. Overcomer Ministry programming to station identification at 2305*. Additional US monitored: **WINB** 13570, 2252; **WWCR** 13845, 2335 (MacKenzie). **AFN** (Key West) 5446 USB, 0605; 7811, 2100-2106 (Frodge). **WHRA** 7555, 0651 (Wood).

2140 UTC on 7280
GERMANY: Deutsche Welle. Middle East news topics (Fraser). **DW Rwanda** relay 11690, 2140. World news to item on Turkish immigrants (Moser).

2218 UTC on 5995
MALI: RDTV du Mali. French phone-in segment by announcer to 2227. Program promotional to music and station ID at 2030. SIO 343 // 4835, SIO 242 (Frodge).

2240 UTC on 7420
BELARUS: Belarus Radio. Clear station identification, SINPO 34433 // 7390 (Slaen).

Thanks to our contributors – Have you sent in YOUR logs?
Send to Gayle Van Horn, c/o Monitoring Times
English broadcast unless otherwise noted.

PROGRAMMING SPOTLIGHT

WHAT'S ON WHEN AND WHERE?

Fred Waterer
fredwaterer@monitoringtimes.com
www.doghousecharlie.com/radio

Spotlight on Radio Netherlands

Radio Netherlands is perhaps one of the easiest and most enjoyable listens in the world of international broadcasting.

Just over 80 years ago the first transmissions were made from Holland to the Dutch East Indies (Indonesia) in late March 1927, making the Dutch among the first to exploit the shortwave medium.

I first made the acquaintance of Radio Netherlands 50 years or so after that, in 1978. Since that time, for the most part, and in one form or another, Radio Netherlands has been, if not a daily visitor, certainly a regular visitor in my home.

While some of the programming which first attracted me to Radio Netherlands is long gone (more on that later) there are still many program choices that will appeal to a listener in the 21st Century.

I mentioned that Radio Netherlands is easy to hear. One can listen to RN via any number of platforms. Of course, they are on shortwave. For those of us in North America, the powerful Bonaire relay in the Netherlands Antilles makes listening a snap.

One can listen via the World Radio Network, available online and via satellite. Check out **www.wrn.org** for schedules.

Programs are also available via the CBC in Canada on Radio One, during the CBC Overnight programming block (midnight to 6am). Radio Netherlands has been on at 1 am local time, but this may have changed by the time you read this. Consult the schedule at **www.cbc.ca/overnight**

CBC Radio Overnight, like all CBC programming, is available live online as well. For the hard-core DXer, you may even try hearing them via the 1kW transmitter in Newfoundland, CKZN, which relays CBC programming.

Finally, you can listen to any Radio Netherlands program via their website, for up to 7 days after the broadcast. You can listen to them

in streaming audio or download the podcast. Go to the website, **www.radionetherlands.nl/** and click on "Listen on Demand" near the top right.

When I began listening to shortwave, Radio Netherlands seemed to be one of the "friendliest" radio stations in the world. It's hard to describe, but the programming had a very personal touch.

Particularly memorable were Jerry and Dody Cowan who hosted *His and Hers* in the 1970s, and of course, Tom Meijer of *Happy Station* fame (see March 2007 *Programming Spotlight*). Radio Netherlands was indeed "The Happy Station," even if you were a "Birthday Bad-Lucker" (registered listener whose birthday just missed coinciding with the *Happy Station* program).

Later, *DX Jukebox* became *Media Network* with Jonathan Marks and the team. Jerry and Dody moved on, Tom retired, and very gradually the tone of the station started to change. Not in a bad way, just different.

Which brings us to the 21st Century: Radio Netherlands is perhaps a more serious, news focused radio station than 30 years ago. You are more likely to hear news, documentaries and current affairs instead of the folksy sound of the 1970s.

In many ways Radio Netherlands has also picked up the slack left when the BBC dropped many frequencies to North America. I've said before, I consider Radio Netherlands a sort of BBC-lite. Which is not necessarily a bad thing.

In a recent very unscientific survey I conducted, RN consistently scored high or highest when listeners were asked, "Which international radio stations are doing a good job, despite limited budgets?"

Responses included:

"I believe that Radio Netherlands, Radio Sweden, Radio Prague, Radio Australia and DW easily fall into that category of 'limited or decreasing means, but doing an above average job with them.' RN sells some of its content on the international market and always takes a big haul of prizes from the New York Radio Show." (John Figliozzi)

"I must admit I enjoy Radio Netherlands although I have a Swedish background. They tend to 'tell it as it is,' great reports, great reporters who try to dig to get good answers and perspective. I do not know how limited their budgets are. Their signal into Guelph ON Canada is just

great." (Paul in Guelph, Ontario)

"RNW agreed. They stand out more than any other. No duds in their lineup at all." (Richard Cuff)

"RN has always been a favorite, with excellent features." (Dan Murray)

"The US media, as you may know, is highly 'selective' in what it covers in these interesting times (heavy on celebrity gossip, light on global warming), so I turn to international broadcasters–Radio Netherlands in particular–to fill in the (sizable) gaps; it's sad, really, since I'm old enough to remember the VOA as a source of pride for an American." (Anne Fanelli)
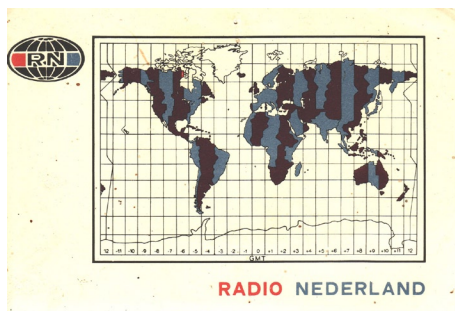
Courtesy of Mark Vosmeier

What can you hear?

Here's a quick review of RN programs to North America. There may be minor variations in transmissions to other regions.

Each transmission opens with the *Newsline*, featuring a roundup of world news, a review of the Dutch press and in depth analysis of items and events in the news. More often than not, you will hear items that do not get coverage in the North American media, or perhaps not enough. Recently I heard features on property rights in China (leading some to question the future of socialism in that country), severe flooding in Madagascar and debate over a proposed anti-missile defense system in Poland and the Czech Republic. The plan was threatening to topple the minority government in Prague, not to mention upsetting their Russian neighbors. It was fascinating stuff, and quite frankly I had not heard anything about these issues prior to hearing them discussed on RN.

The *Newsline* team does a fantastic job. Well worth the time to listen.

Monday

Research File
Radio Netherlands' science and technology program. Perhaps along with **Quirks and Quarks** on the CBC, the best program in this genre. The **Research File**'s goal is "explaining and putting the latest breakthroughs into perspective, as well as exploring new discoveries and ongoing research." Recent episodes have looked at addiction, designing an eco-friendly passenger plane, new technology that keeps cells alive under the microscope, and developments in the treatment of Crohn's disease. Laura Durnford and Thijs Westerbeek host the program. They are both very professional and make the subject matter most interesting.

Tuesday

EuroQuest
Hosted by Jonathan Groubert, **EuroQuest** is a digest of news and stories from across Europe. Art, Music, the Environment, Health Matters, and Culture are just some of the areas covered in this program.
The program has recently looked at child marriage among the Roma of Europe, difficulties the disabled have finding a job, blind shooting competitions (!), honor killings and the equality of men and women in Turkey.
EuroQuest is also rebroadcast on over 300 stations worldwide.

Wednesday

Documentary
Radio Netherlands documentaries have received "over 40 awards and nominations in the past five years" from "New York Radio Festivals, the Asia-Pacific Broadcasting Union, UNICEF, the National Lesbian & Gay Journalists Association, the Prix Bayeux for War Correspondents and others." (RN website)
These are always well done presentations on any number of topics, including the ongoing crisis in Zimbabwe, romance novels, and the use of words to shape public opinion. Fascinating stuff.

Thursday

Dutch Horizons
Hosted by Chris Chambers, the program "goes beyond the traditional Dutch stereotypes to find out what's really going on in the Netherlands." Among the topics looked at in recent weeks have included the new CCTV Headquarters in Beijing, designed in Rotterdam, an Amsterdam exhibit of Ottoman antiquities, and women in past centuries, who dressed and lived as men, and an interview with Ayaan Hirsi Ali, former Dutch MP, on her latest film about Islam.

Friday

Network Europe
This program has been discussed before in this column. It is a co-operative effort between Deutsche Welle, Polish Radio, Radio Bulgaria, RN, Radio France International, Radio Prague, Radio Romania, Radio Slovakia, Radio Slovenia and Radio Sweden. It's a weekly look at events, life and culture in Europe.
"**Network Europe** is a unique example of European co-operation. Produced by the continent's leading international broadcasters, the programme reflects the diversity of European society and voices."
The program's website is: **http://networkeurope.radio.cz/**

Saturday

Weekend Connection
Weekend Connection is produced by the Newsline team and looks at the week's news, stories that will be developing in the coming week, and other items in depth.

Vox Humana
Early on in 2007, Radio Netherlands has been running episodes of this program from the archives. It is an interesting program, looking at life and people high and low throughout the world.
It may be a look at the work of an innovative musician, a discussion of how a belief in luck and fate shapes peoples lives in the Far East, or a talk with the daughter of a murdered scientist from Sri Lanka. Interesting looks at people from all walks of life.

Sunday

Amsterdam Forum
Amsterdam Forum is hosted by Sarah Johnson, and is billed as Radio Netherlands' "discussion program." Topics have included our attitudes towards meat and meat production, why teenagers have trouble being openly gay and the uncontrolled growth of some African cities. Usually a number of guests discuss the issue either in the studio or by phone. The program provides solid, in-depth coverage of a different issue in each program. Well worth hearing.

Echoes
Echoes is the Radio Netherlands version of a mailbag program. Listeners' letters are acknowledged and questions answered. Mindy Ran hosts the program. Another feature of the program is called "Critical Eye." It's basically a commentary about some topic in the news, or something going on in the culture, by Perro de Jong. It's similar to (but not the same as) Alistair Cooke's *Letter from America*.

To hear Radio Netherlands on shortwave, try 11675 kHz mornings at 1100 or 6165 kHz evenings at 0000, 0100 and 0500 UTC. These times and frequencies may have changed by the time you read this. As of this writing I believe them to be correct.

Other Benelux broadcasters…

Sadly, one cannot hear English from the other two Benelux countries any more.

Radio Luxemburg was occasionally heard here in the past, but dropped shortwave some time ago. It was nice to hear and QSL them, but the programming was nothing special. For many years Radio Luxemburg took advantage of the radio situation in Britain, and offered the type of programming that could not be heard there at the time…in the same manner as the offshore pirates operated.

Any time I heard it, Radio Luxemburg basically was a pop music station, playing, for the most part, the top hits in Britain at the time. Nice to catch, but not very notable program-wise.

Belgium

BRT used to have quite an enjoyable English service, but that has gone the way of many others. If you want to hear Belgium, you have to listen in Flemish via **Radio Vlaanderen International** or in French via RTBF.

RVI broadcasts via transmitters in the UK. 6040 kHz was reportedly used in the winter season 1900-1200 UTC; presumably that frequency might change by the time you read this.

RTBF, the voice of the Francophone community in Belgium, was reportedly on the air from 0550-0700 and from 1800-2100 on 9970 kHz. Again, these times and frequencies were reported for the recent winter season and are subject to change.

A special thank you to my friend and fellow DXer, Mark Vosmeier, who allowed me to use some of his Radio Netherlands photos for this column.

Programming for our Future

There is one segment of listeners which doesn't get a lot of attention. What about children's programming? Think about it: As the saying goes, children are the future. There's very little programming specifically for children. But there is some.

In the coming weeks, along with an "expert panel" of children in the United States, Canada, and elsewhere, I'll ask them for their thoughts, their likes and dislikes when it comes to children's programming on the radio.

What makes them experts? They are children!

We should be reporting back in the coming months. If you…or your children…have any thoughts, ideas or suggestions, feel free to email me!

Until next month, Cheers!

THE QSL REPORT

VERIFICATIONS RECEIVED BY OUR READERS

Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com

75 Million QSOs and Growing

This month is *MT*'s annual focus on amateur radio, and it's time for a brief reminder of amateur radio's popular *Logbook of the World*.

ARRL's *Logbook of the World* is the largest repository of amateur radio log records, submitted for a worldwide amateur radio audience. When both radio contacts participate in a one-on-one contact (QSO) and submit their records to *Logbook of the World*, the result is a cardless verification, used for ARRL credit.

The League's QSL-cardless awards and contact credit system has far exceeded their original predictions in 2003. In the first month alone, more than 14 million QSOs were added to the database. Today, LoTW has grown to over 75 million and is well on its way to being adopted by the worldwide community of DXers.

LoTW is open to all amateur radio operators, and applying for a digital certificate is the first step toward taking advantage of the system. The digital certificate authenticates the user's identity. For more information about *Logbook of the World*, please refer to: **www.arrl.org/lotw/**

AMATEUR RADIO

Canada (Nuvavut), K9AJ/VY0 Southampton Island (NA-007). Full data photo card. Received in 65 days via ARRL bureau. (L. Van Horn, NC)

Guadaloupe Island FG/IK2JYT, 20 meters SSB. Full data color folder photo card. Received in 65 days via ARRL bureau. (Van Horn)

United States (Utah) K7T Philo T. Farnsworth Special Event Station, 20 meters SSB. Full data two-color photo card for an SASE. Received in 35 days via QSL Manager W7WES, C. Wesley Wilkinson, 4203 Williamsburg Dr., West Valley City, UT 84128-6519. (Van Horn)

United States (Florida) WA4ECY Corry Station ARC. 17 meters SSB. Full data two color card. Received in four months for an SASE via Corry Station ARC, Code 9900 NTTC Corry Station, Pensacola, FL 32511-5000. (Van Horn).

Venezuela YV4A, Venezuela Camatagua DX Club Contest Station. 10/20/40 meters SSB. Full data two color card. Received in 65 days for an SASE to QSL Manager, R. Leandro, P.O. Box 020010, Miami, FL 33102-0010. (Van Horn)

AUSTRIA

Radio Osterreich 1, 9870 kHz. Verification letter with illegible signature and photo of Salzburg on the back, plus German program schedule. Received for a German reception report emailed to: *roi.service@orf.at* Reports may also be directed to: Listener Service, Argentinierstrasse 30a A-1040 Vienna, Austria. (Dan Mallory, MA)

FM

92.9 MHz, Voice of Barbados. Full data verification letter, signed by Ronald L.H. Clarke-program Director, Gospel FM & HOTT FM. Station info sheet and Barbados Holiday Guide brochure. Received in two years for an FM report. Station address: P.O. Box 1267, Barbados. (Arnaldo Slaen, Buenos Aires, Argentina)

HUNGARY

Radio Budapest 9590 kHz. Full data QSL card featuring classic sepia photo, unsigned. Received in four weeks for reception report emailed to: *english@kaf.radio.hu* (Mallory) Reports may also be directed to: Bródy Sándor utca 5-7, H-1800 Budapest, Hungary.

ICELAND

American Forces Radio 13855 kHz USB. Full data AFRTS Logo card signed by Robert Winkler. Received in 16 days from a 2003 English report. QSL address: DOD, NMC DET AFRTS-DMC, 23755 Z Street -Bldg. 2730, Riverside, CA 92518-2017 USA. (Bill Wilkins, Springfield, MO)

JAPAN

Nikkei Radio, 6055 kHz. Full data tri-color logo card unsigned. Received in ten days for an English report. Station address: Nikkei Radio Broadcasting Corp., 9-15 Akasaka 1-chome, Minato-ku, Tokyo 107-8373 Japan. (Alokesh Gupta, India)

MEDIUM WAVE

675 kHz AM, Vietnam. Full data QSL card unsigned, verifying 675 AM and 6175 kHz. Received in 100 days, after numerous attempts via regular mail and email, for both frequencies. Not a new medium wave or shortwave country, but a new AM frequency verified. Station address: 37 Ba Tien , Ha Noi Vietnam. (Patrick Martin, Seaside, OR)

1125 DXGM kHz AM, Philippines. Nice verification letter, signed by retiring General Manager Jose M. Lansang. Three souvenir postcards of Mindanao enclosed. Station address: Republic BC System, Davao City 8000, Davao Del Sur, Philippines. QSL # 24 Philippines. (Martin)

Virgin Radio 1215 kHz AM. Full data QSL card signed by David Jones-Head of Technology Services. Received in four months for an English AM report. Station address: No. 1 Golden Square, London W1F 9DJ United Kingdom. (Daniel L. Serbrick, NJ)

WHKY 1290 kHz AM. Partial data verification on station letterhead, signed by Jeff Log-Sta. Manager. Received in 32 days for an AM report, one U.S. dollar and an address label (not used). Station address: P.O. Box 1059, Hickory, NC 28603-1059 USA. (Wilkins)

NORTH KOREA

Voice of Korea 9335 kHz. Full data *Radio Pyongyang* photo postcard. Received in 69 days. Package arrived in a brown envelope with a form letter requesting further reports. English program schedule, copy of *Pyongyang Times*, plus an assortment of station souvenirs and info sheet. Station address: Voice of Korea, External Service, Korean Central Broadcasting Station, Pyongyang, Democratic People's Republic of Korea. (Rich D'Angelo, PA/DX Window) *Congrats, Rich, VO Korea is not verified often, and usually not directly! - GVH*

ROMANIA

Radio Romania International 11940 kHz. Full data color card, unsigned, plus station schedule. Received in 45 days for an English report to: *engl@rri.ro*. Reports may also be directed to: 60-62 Berthelot St, RO-70747 Bucharest, Romania. (Frank Hillton, Charleston, SC)

ST. HELENA

Radio St. Helena 11092.5 kHz USB. Full data *DSWCI 50th Anniversary* card signed by Anker Petersen. Card commemorates anniversary and 2006 *St. Helena Day*. Received in 18 days for an English report and one IRC. QSL address: Danish Shortwave Club International, Tavleager 31, DK 2670 Greve, Denmark. (Wilkins; Malloy)

UTILITY

USCG Station NMN CAMSLANT (Communications Area Master Station Atlantic) 8983 kHz SSB. Full data color/station photo card, signed by Joseph Cook-QSL Manager. Received in 288 days for a utility report. QSL address: NMN, Commanding Officer, c/o NAVSECGURANT Northwest, Chesapeake, VA 23322-2598 USA. (Richard W. Parker KB2DMD, Geryville, PA)

VENEZUELA

Radio Amazonas International, 4940 kHz. Full data Spanish computer generated card signed by Sr. Jorge Garcia Rangel-QSL Manager, plus two Spanish/English personal letters. Received in 419 days for an English report and two U.S. dollars. Station address: Sr. Jorge Garcia Rangel-QSL Manager, Calle Roma, Qta: Costa Rica No. A-16, Urbanization Alto Barinas, Barinas 5201, Venezuela. (Scott Barbour Jr., Intervale, NH)

How to Use the Shortwave Guide

• •

0000-0100 twhfa   USA, Voice of America   5995am   6130ca   7405am   9455af

① ② ⑤   ③   ④   ⑥ ⑦

Convert your time to UTC.

Broadcast <u>time on</u> ① and <u>time off</u> ② are expressed in Coordinated Universal Time (UTC) – the time at the 0 meridian near Greenwich, England. To translate your local time into UTC, first convert your local time to 24-hour format, then add (during Daylight Saving Time) 4, 5, 6 or 7 hours for Eastern, Central, Mountain or Pacific Times, respectively. Eastern, Central, and Pacific Times are already converted to UTC for you at the top of each hour.

Note that all *dates*, as well as times, are in UTC; for example, a show which might air at 0030 UTC *Sunday* will be heard on *Saturday* evening in America (in other words, 8:30 pm Eastern, 7:30 pm Central, etc.).

Find the station you want to hear.

Look at the page which corresponds to the time you will be listening. English broadcasts are listed by UTC <u>time on</u> ①, then alphabetically by <u>country</u> ③, followed by the <u>station name</u> ④. (If the station name is the same as the country, we don't repeat it, e.g., "Vanuatu, Radio" [Vanuatu].)

If a broadcast is not *daily*, the <u>days of broadcast</u> ⑤ will appear in the column following the time of broadcast, using the following codes:

Codes
s/Sun	Sunday
m/Mon	Monday
t	Tuesday
w	Wednesday
h	Thursday
f	Friday
a/Sat	Saturday
occ:	occasional
DRM:	Digital Radio Mondiale
irreg	Irregular broadcasts
vl	Various languages

Choose the most promising frequencies for the time, location and conditions.

The <u>frequencies</u> ⑥ follow to the right of the station listing; all frequencies are listed in kilohertz (kHz). Not all listed stations will be heard from your location and virtually none of them will be heard all the time on all frequencies.

Shortwave broadcast stations change some of their frequencies at least twice a year, in April and October, to adapt to seasonal conditions. But they can also change in response to short-term conditions, interference, equipment problems, etc. Our frequency manager coordinates published station schedules with confirmations and reports from her monitoring team and *MT* readers to make the Shortwave Guide up-to-date as of one week before print deadline.

To help you find the most promising signal for your location, immediately following each frequency we've included information on the <u>target area</u> ⑦ of the broadcast. Signals beamed toward your area will generally be easier to hear than those beamed elsewhere, even though the latter will often still be audible.

Target Areas
af:	Africa
al:	alternate frequency (occasional use only)
am:	The Americas
as:	Asia
ca:	Central America
do:	domestic broadcast
eu:	Europe
me:	Middle East
na:	North America
oc:	Oceania
pa:	Pacific
sa:	South America
va:	various

Shortwave Broadcast Bands

kHz	Meters
2300-2495	120 meters (Note 1)
3200-3400	90 meters (Note 1)
3900-3950	75 meters (Regional band, used for broadcasting in Asia only)
3950-4000	75 meters (Regional band, used for broadcasting in Asia and Europe)
4750-4995	60 meters (Note 1)
5005-5060	60 meters (Note 1)
5730-5900	49 meter NIB (Note 2)
5900-5950	49 meter WARC-92 band (Note 3)
5950-6200	49 meters
6200-6295	49 meter NIB (Note 2)
6890-6990	41 meter NIB (Note 2)
7100-7300	41 meters (Regional band, not allocated for broadcasting in the western hemisphere) (Note 4)
7300-7350	41 meter WARC-92 band (Note 3)
7350-7600	41 meter NIB (Note 2)
9250-9400	31 meter NIB (Note 2)
9400-9500	31 meter WARC-92 band (Note 3)
9500-9900	31 meters
11500-11600	25 meter NIB (Note 2)
11600-11650	25 meter WARC-92 band (Note 3)
11650-12050	25 meters
12050-12100	25 meter WARC-92 band (Note 3)
12100-12600	25 meter NIB (Note 2)
13570-13600	22 meter WARC-92 band (Note 3)
13600-13800	22 meters
13800-13870	22 meter WARC-92 band (Note 3)
15030-15100	19 meter NIB (Note 2)
15100-15600	19 meters
15600-15800	19 meter WARC-92 band (Note 3)
17480-17550	17 meter WARC-92 band (Note 3)
17550-17900	17 meters
18900-19020	15 meter WARC-92 band (Note 3)
21450-21850	13 meters
25670-26100	11 meters

Notes

Note 1   Tropical bands, 120/90/60 meters are for broadcast use only in designated tropical areas of the world.

Note 2   Broadcasters can use this frequency range on a (NIB) non-interference basis only.

Note 3   WARC-92 bands are allocated officially for use by HF broadcasting stations in 2007

Note 4   WRC-03 update. After March 29, 2009, the spectrum from 7100-7200 kHz will no longer be available for broadcast purposes and will be turned over to amateur radio operations worldwide

0000 UTC - 8PM EDT / 7PM CDT / 5PM PDT

Start	End	Days	Station	Frequencies
0000	0015		Japan, Radio Japan/NHK World	13650as 17810as
0000	0030		Australia, HCJB Global	15525va
0000	0030		Australia, Radio	9660as 12080as 13670as 15240pa 17715as 17750va 17775va 17795va
0000	0030		Burma, Dem Voice of Burma	5955eu
0000	0030		Egypt, Radio Cairo	11950na
0000	0030		Thailand, Radio	9680af
0000	0030		UK, BBC World Service	3915as 11945as 17615as
0000	0030		USA, Voice of America	7405as
0000	0045		India, All India Radio	9705as 9950as 11620as 11645as 13605as
0000	0057		Canada, Radio Canada Intl	11700as
0000	0058		Germany, Deutsche Welle	7245as 13730as 15595as
0000	0059		Spain, Radio Exterior Espana	6055na
0000	0100		Anguilla, University Network	6090am
0000	0100		Australia, ABC NT Alice Springs	2310do 4835do
0000	0100		Australia, ABC NT Katherine	5025do
0000	0100		Australia, ABC NT Tennant Creek	4910do
0000	0100		Canada, CFRX Toronto ON	6070na
0000	0100		Canada, CFVP Calgary AB	6030na
0000	0100		Canada, CKZN St John's NF	6160na
0000	0100		Canada, CKZU Vancouver BC	6160na
0000	0100		China, China Radio Intl	6020na 6075as 7130as 7180as 9425na 9570as 11650as 11885as
0000	0100		Costa Rica, University Network	5030va 6150va 7375va 9725va
0000	0100		Guyana, Voice of	3291do
0000	0100		Japan, Radio Japan/NHK World	6145na
0000	0100		Malaysia, RTM/Trax FM	7295as
0000	0100		Netherlands, Radio	9845na
0000	0100		New Zealand, Radio NZ Intl	13720pa
0000	0100	DRM	New Zealand, Radio NZ Intl	15720pa
0000	0100	vl	Papua New Guinea, Wantok R. Light	7120va
0000	0100		Romania, Radio Romania Intl	9775na 11790na
0000	0100		Singapore, MediaCorp Radio	6150do
0000	0100		UK, BBC World Service	5970as 6195as 9605as 9740as 11955as 15285as 15360as
0000	0100	DRM	UK, BBC World Service	6010na
0000	0100	f	UK, Bible Voice	5980me
0000	0100		Ukraine, Radio Ukraine Intl	7530eu
0000	0100		USA, American Forces Radio	4319usb 5446usb 5765usb 6350usb 7811usb 10320usb 12133usb 13362usb
0000	0100		USA, Family Radio Worldwide FL	6065na 9505na 9715na 11720am
0000	0100		USA, KAIJ Dallas TX	5755na
0000	0100		USA, KTBN Salt Lake City UT	7505na 15590na
0000	0100		USA, WBCQ Monticello ME	5110na 7415na 9330na
0000	0100		USA, WBOH Newport NC	5920am
0000	0100		USA, WEWN Vandiver AL	5810va
0000	0100		USA, WHRA Greenbush ME	5850na
0000	0100		USA, WHRI Cypress Creek SC	7315am 7490am
0000	0100		USA, WINB Red Lion PA	9265am
0000	0100		USA, WRMI Miami FL	9955va
0000	0100		USA, WTJC Newport NC	9370na
0000	0100		USA, WWCR Nashville TN	3215na 5070na 7465na 13845na
0000	0100		USA, WWRB Manchester TN	3185na 5050na 6890na
0000	0100	mtwhfa	USA, WWRB Manchester TN	5745ca
0000	0100		Zambia, Christian Voice	4965af
0005	0030	Sun/Mon	Austria, Radio Austria Intl	7325na
0005	0100		Canada, Radio Canada Intl	6100na
0013	0028	twhfa	Austria, Radio Austria Intl	7325na
0030	0045	s	Germany, Pan American BC	6165as
0030	0100		Australia, Radio	9660as 12080as 13670as 15240pa 15415as 17715as 17750va 17795va
0030	0100		Lithuania, Radio Vilnius	9875na
0030	0100		Thailand, Radio	5890na
0030	0100	fas	UK, Bible Voice	5955as
0030	0100		USA, Voice of America	7120va 9620va 11695va 11725va 11805va 12005va 15185va 15205va
0033	0100	Sun/Mon	Austria, Radio Austria Intl	7325na
0043	0058	twhfa	Austria, Radio Austria Intl	7325na
0055	0100		Italy, RAI Italia	11800na

0100 UTC - 9PM EDT / 8PM CDT / 6PM PDT

Start	End	Days	Station	Frequencies
0100	0104		Canada, Radio Canada Intl	6100na
0100	0115		Italy, RAI Italia	11800na
0100	0127		Czech Rep, Radio Prague	6200na 7345na
0100	0128		Vietnam, Voice of	6175na
0100	0130	s	Germany, Universal Life	7260as
0100	0130		Hungary, Radio Budapest	6040na
0100	0130		Slovakia, Radio Slovakia Int	5930na 9440sa
0100	0130		UK, BBC World Service	7230na 9440sa
0100	0200		Anguilla, University Network	6090am
0100	0200		Australia, ABC NT Katherine	5025do
0100	0200		Australia, ABC NT Tennant Creek	4910do
0100	0200		Australia, Radio	9660as 12080as 13670as 15240pa 15415as 15515as 17715as 17750va 17795va 21745va
0100	0200		Canada, CFRX Toronto ON	6070na
0100	0200		Canada, CFVP Calgary AB	6030na
0100	0200		Canada, CKZN St John's NF	6160na
0100	0200		Canada, CKZU Vancouver BC	6160na
0100	0200		China, China Radio Intl	6005na 6020na 6075as 6080na 7130eu 7180as 9570na 9580na 11650as 11885as
0100	0200		Costa Rica, University Network	5030va 6150va 7375va 9725va
0100	0200		Cuba, Radio Havana	6000na 6180na
0100	0200		Guyana, Voice of	3291do
0100	0200		Indonesia, Voice of	9525as 11785pa 15150al
0100	0200		Japan, Radio Japan/NHK World	6030va 11860as 11935sa 15325as 17685pa 17810as 17825ca 17845as
0100	0200		Malaysia, RTM/Trax FM	7295as
0100	0200		Netherlands, Radio	9845na
0100	0200		New Zealand, Radio NZ Intl	13720pa
0100	0200	DRM	New Zealand, Radio NZ Intl	15720pa
0100	0200		North Korea, Voice of Korea	7140as 9345as 9730am 11735am 13760am 15180am
0100	0200	vl	Papua New Guinea, Wantok R. Light	7120va
0100	0200		Singapore, MediaCorp Radio	6150do
0100	0200		Sri Lanka, SLBC	6005as 9770as 15745as
0100	0200		Taiwan, Radio Taiwan Intl	11875as 15465na
0100	0200		UK, BBC World Service	7320as 9605as 11955as 15285as 15310as 15360as
0100	0200	f	UK, Bible Voice	5945me
0100	0200		USA, American Forces Radio	4319usb 5446usb 5765usb 6350usb 7811usb 10320usb 12133usb 13362usb
0100	0200		USA, Family Radio Worldwide FL	6065na 9505na 15195as
0100	0200		USA, KAIJ Dallas TX	5755na
0100	0200		USA, KTBN Salt Lake City UT	7505na
0100	0200		USA, KWHR Naalehu HI	17655as
0100	0200		USA, Voice of America	11705va 12005va
0100	0200		USA, WBCQ Monticello ME	5110na 7415na 9330na
0100	0200		USA, WBOH Newport NC	5920am
0100	0200		USA, WEWN Vandiver AL	5810na
0100	0200		USA, WHRA Greenbush ME	5850na
0100	0200	mtwhf	USA, WHRI Cypress Creek SC	5835am 7490am
0100	0200	as	USA, WHRI Cypress Creek SC	7315am
0100	0200		USA, WINB Red Lion PA	9265am
0100	0200	sm	USA, WRMI Miami FL	9955va
0100	0200	twhfa	USA, WRMI Miami FL	7385va
0100	0200		USA, WTJC Newport NC	9370na
0100	0200		USA, WWCR Nashville TN	3215na 5070na 5935na 7465na
0100	0200		USA, WWRB Manchester TN	3185na 5050na 6890na
0100	0200	mtwhfa	USA, WWRB Manchester TN	5745ca
0100	0200		Uzbekistan, CVC International	7355as
0100	0200		Zambia, Christian Voice	4965af
0115	0130	Sat	Australia, HCJB Global	15405va
0130	0200		Iran, Voice of the Islamic Rep	6120na 7160na
0130	0200		Lithuania, Radio Vilnius	7325na
0130	0200		Sweden, Radio	6010na 11675va
0130	0200		USA, Voice of America	5960va
0130	0200	twhfa	USA, Voice of America	7405va
0140	0200		Vatican City, Vatican Radio	5915va 7335va
0145	0200	twhfas	Albania, Radio Tirana	6115eu 7425eu

0200 UTC - 10PM EDT / 9PM CDT / 7PM PDT

Start	End	Days	Station	Frequencies
0200	0227		Czech Rep, Radio Prague	6200na 7345na
0200	0227		Iran, Voice of the Islamic Rep	6120na 7160na
0200	0300		Anguilla, University Network	6090am
0200	0300	twhfa	Argentina, RAE	11710am

Start	Stop	Notes	Station	Freq1	Freq2	Freq3	Freq4
0200	0300		Australia, ABC NT Alice Springs	2310do			
			4835do				
0200	0300		Australia, ABC NT Katherine 5025do				
0200	0300		Australia, ABC NT Tennant Creek	4910do			
0200	0300		Australia, Radio 9660as	12080as	13670as		
			15240pa	15415as	15515as	17750va	
			21725va				
0200	0300		Bulgaria, Radio 9700na	11700na			
0200	0300		Canada, CFRX Toronto ON 6070na				
0200	0300		Canada, CFVP Calgary AB 6030na				
0200	0300		Canada, CKZN St John's NF 6160na				
0200	0300		Canada, CKZU Vancouver BC	6160na			
0200	0300		China, China Radio Intl 11770as	13640as			
0200	0300		Costa Rica, University Network	5030va			
			6150va	7375va	9725va		
0200	0300		Cuba, Radio Havana 6000na	6180na			
0200	0300		Egypt, Radio Cairo 7270na				
0200	0300		Guyana, Voice of 3291do				
0200	0300		Malaysia, RTM/Trax FM 7295as				
0200	0300	DRM	Netherlands, Radio 9830va				
0200	0300		New Zealand, Radio NZ Intl 13720pa				
0200	0300	DRM	New Zealand, Radio NZ Intl 15720pa				
0200	0300		North Korea, Voice of Korea13650as	15100as			
0200	0300	vl	Papua New Guinea, Wantok R. Light 7120va				
0200	0300		Philippines, Radio Pilipinas 12025va	15115va			
			15230va				
0200	0300		Russia, Voice of 6230na	7250na	13735na		
			15425na				
0200	0300		Singapore, MediaCorp Radio	6150do			
0200	0300		South Korea, KBS World Radio	9560na			
			15575na				
0200	0300		Sri Lanka, SLBC 6005as	9770as	15745as		
0200	0300		UK, BBC World Service	6035af	6195as		
			7320as	11750as	11955as	15285as	
			15310as	15360as	17760as		
0200	0300		USA, American Forces Radio	4319usb			
			5446usb	5765usb	6350usb	7811usb	
			10320usb	12133usb	13362usb		
0200	0300		USA, Family Radio Worldwide FL	5985am			
			6065na	9505na	9525na	11855am	
0200	0300		USA, KAIJ Dallas TX	5755na			
0200	0300		USA, KJES Vado NM	7555na			
0200	0300		USA, KTBN Salt Lake City UT 7505na				
0200	0300		USA, KWHR Naalehu HI	17655as			
0200	0300		USA, WBCQ Monticello ME	5110na	7415na		
			9330na				
0200	0300		USA, WBOH Newport NC	5920am			
0200	0300		USA, WEWN Vandiver AL	5810va			
0200	0300		USA, WHRA Greenbush ME	5850na			
0200	0300	as	USA, WHRI Cypress Creek SC	7315am			
0200	0300	mtwhf	USA, WHRI Cypress Creek SC	5835am			
			7490am				
0200	0300		USA, WINB Red Lion PA	9265am			
0200	0300	sm	USA, WRMI Miami FL	9955va			
0200	0300	twhfa	USA, WRMI Miami FL	7385na			
0200	0300		USA, WTJC Newport NC	9370na			
0200	0300		USA, WWCR Nashville TN	3215na	5070na		
			5765na	5935na			
0200	0300		USA, WWRB Manchester TN 3185na	5050na			
			6890na				
0200	0300	mtwhfa	USA, WWRB Manchester TN 5745ca				
0200	0300		Uzbekistan, CVC International	7355as			
0200	0300		Zambia, Christian Voice	4965af			
0200	3000		Taiwan, Radio Taiwan Intl	5950na	9680am		
0215	0220		Vatican City, Vatican Radio	12070va			
0215	0230		Nepal, Radio 3230as	5005as	6100as		
			7165as				
0230	0258		Vietnam, Voice of6175na				
0230	0300	twhfas	Albania, Radio Tirana	6115eu	7425eu		
0230	0300		Hungary, Radio Budapest	6195na			
0230	0300		Sweden, Radio 6010na				
0245	0300		Myanmar, Radio 9730do				
0250	0300		Vatican City, Vatican Radio	7305am	9610am		
0255	0300	vl	Rwanda, Radio 6055do				

0300 UTC - 11PM EDT / 10PM CDT / 8PM PDT

Start	Stop	Notes	Station	Freq1	Freq2
0300	0307		Croatia, Croatian Radio	7285na	
0300	0320		Vatican City, Vatican Radio	7305am	9610am
0300	0330		Egypt, Radio Cairo	7270na	
0300	0330		Myanmar, Radio 9730do		
0300	0330		Philippines, Radio Pilipinas	12025va	15115va
			15230va		
0300	0330	s	Swaziland, TWR 3200af		
0300	0330		Thailand, Radio 5890na		
0300	0330		USA, KJES Vado NM	7555na	
0300	0330		USA, WBCQ Monticello ME 9330na		
0300	0330		Vatican City, Vatican Radio 7360af		
0300	0400		Anguilla, University Network	6090am	
0300	0400		Australia, ABC NT Alice Springs	2310do	
			4835do		

Start	Stop	Notes	Station	Freq1	Freq2	Freq3	Freq4
0300	0400		Australia, ABC NT Katherine 5025do				
0300	0400		Australia, ABC NT Tennant Creek	4910do			
0300	0400		Australia, Radio 9660as	12080as	13670as		
			15240pa	15415as	15515as	17750va	
			21725va				
0300	0400	twhfas	Canada, CBC NQ SW Service	9625na			
0300	0400		Canada, CFRX Toronto ON 6070na				
0300	0400		Canada, CFVP Calgary AB 6030na				
0300	0400		Canada, CKZN St John's NF 6160na				
0300	0400		Canada, CKZU Vancouver BC	6160na			
0300	0400		China, China Radio Intl 6190na	9460as			
			9690na	9790na	11770as	13620as	
			15110as	15120as			
0300	0400		Costa Rica, University Network	5030va			
			6150va	7375va	9725va		
0300	0400		Cuba, Radio Havana	6000na	6180na		
0300	0400		Germany, Deutsche Welle	11695as	13810as		
0300	0400		Guyana, Voice of 3291do				
0300	0400		Japan, Radio Japan/NHK World	21610pa			
0300	0400		Malaysia, RTM/Trax FM	7295as			
0300	0400		Malaysia, RTM/Voice of Malaysia	6175as			
			9750as	15295as			
0300	0400		New Zealand, Radio NZ Intl 13720pa				
0300	0400	DRM	New Zealand, Radio NZ Intl 15720pa				
0300	0400		North Korea, Voice of Korea7140as	9345as			
			9730as				
0300	0400	vl	Papua New Guinea, Wantok R. Light	7120va			
0300	0400		Romania, Radio Romania Intl	6150va			
			9645na	11895va	15220va		
0300	0400		Russia, Voice of 5995me	6240na	7350na		
			13735na	15425na			
0300	0400	vl	Rwanda, Radio 6055do				
0300	0400		Singapore, MediaCorp Radio	6150do			
0300	0400		South Africa, Channel Africa 3345af	7390af			
0300	0400		Sri Lanka, SLBC 6005as	9770as	15745as		
0300	0400		Taiwan, Radio Taiwan Intl	5950am	15215sa		
0300	0400		Turkey, Voice of 5975va	7270va			
0300	0400	s	UK, BBC World Service	6195as			
0300	0400		UK, BBC World Service	3255af	6005me		
			6145af	6190af	7130af	7160af	
			9410as	9750af	11760as	15320as	
			15360as	17760as	17790as	21660as	
0300	0400		Ukraine, Radio Ukraine Intl 7530na				
0300	0400		USA, American Forces Radio	4319usb			
			5446usb	5765usb	6350usb	7811usb	
			10320usb	12133usb	13362usb		
0300	0400		USA, Family Radio Worldwide FL	6065na			
			9505na	9985am	11740na		
0300	0400		USA, KAIJ Dallas TX	5755na			
0300	0400		USA, KTBN Salt Lake City UT 7505na				
0300	0400		USA, KWHR Naalehu HI	17655as			
0300	0400		USA, Voice of America	4930af	6080af		
			15580af				
0300	0400		USA, WBCQ Monticello ME	5110na	7415na		
0300	0400		USA, WBOH Newport NC	5920am			
0300	0400		USA, WEWN Vandiver AL	5810va			
0300	0400		USA, WHRA Greenbush ME	5850na			
0300	0400	mtwhf	USA, WHRI Cypress Creek SC	5835am			
			6110am	7520am			
0300	0400	as	USA, WHRI Cypress Creek SC	7315am			
0300	0400		USA, WINB Red Lion PA	9265am			
0300	0400		USA, WRMI Miami FL	9955va			
0300	0400		USA, WTJC Newport NC	9370na			
0300	0400		USA, WWCR Nashville TN	3215na	5070na		
			5765na	5935na			
0300	0400		USA, WWRB Manchester TN 3185na	5050na			
			6890na				
0300	0400	mtwhfa	USA, WWRB Manchester TN 5745ca				
0300	0400		Uzbekistan, CVC International	13685as			
0300	0400		Zambia, Christian Voice	4965af			
0300	0500	vl/mtwhf	UK, Sudan Radio Service	7120af			
0330	0335		Bahrain, Radio Bahrain	6010as			
0330	0358		Vietnam, Voice of6175am				
0330	0400		UK, BBC World Service	11665af			
0330	0400	twhfas	USA, WBCQ Monticello ME 9330na				

0400 UTC - 12AM EDT / 11PM CDT / 9PM PDT

Start	Stop	Notes	Station	Freq1	Freq2	Freq3	Freq4
0400	0427		Czech Rep, Radio Prague	6200na	7345na		
0400	0430		Australia, Radio 9660as	12080as	13670as		
			15240pa	15515as	17750va	21725va	
0400	0430	mtwhf	France, Radio France Intl	7270af	7315af		
0400	0430	as	USA, WWRB Manchester TN 5745ca				
0400	0458		New Zealand, Radio NZ Intl 13720pa				
0400	0458	DRM	New Zealand, Radio NZ Intl 15720pa				
0400	0500		Anguilla, University Network	6090am			
0400	0500		Armenia, CVC International 15515as				
0400	0500		Australia, ABC NT Alice Springs	2310do			
			4835do				
0400	0500		Australia, ABC NT Katherine 5025do				
0400	0500		Australia, ABC NT Tennant Creek	4910do			

Start	Stop	Days	Station	Freq1	Freq2	Freq3	Freq4
0400	0500	twhfas	Canada, CBC NQ SW Service	9625na			
0400	0500		Canada, CFRX Toronto ON 6070na				
0400	0500		Canada, CKZN St John's NF 6160na				
0400	0500		Canada, CKZU Vancouver BC	6160na			
0400	0500		China, China Radio Intl	6190na	9460as		
			13620as	15120as	17725as	17855as	
0400	0500		Costa Rica, University Network	5030va			
			6150va	7375va	9725va		
0400	0500		Cuba, Radio Havana	6000na	6180na		
0400	0500		Germany, Deutsche Welle	7225af	7245af		
			12045af	15445af			
0400	0500		Guyana, Voice of 3291do				
0400	0500		Malaysia, RTM/Trax FM	7295as			
0400	0500		Malaysia, RTM/Voice of Malaysia	6175as			
			9750as	15295as			
0400	0500		Netherlands, Radio	6165na			
0400	0500	vl	Papua New Guinea, Wantok R. Light	7120va			
0400	0500		Russia, Voice of 7150na	7255na	7350na		
			9840na	12030na	13735na		
0400	0500	vl	Rwanda, Radio 6055do				
0400	0500		Singapore, MediaCorp Radio	6150do			
0400	0500		South Africa, Channel Africa 3345af				
0400	0500	vl	Uganda, Radio 4976do	5026do			
0400	0500		UK, BBC World Service	3255af	6005af		
			6190af	6195eu	7120af	7160af	
			11665af	11760as	12095af	15310as	
			15360as	15575as	17760as	17790as	
			21660as				
0400	0500	DRM	UK, BBC World Service	6010na			
0400	0500		USA, American Forces Radio	4319usb			
			5446usb	5765usb	6350usb	7811usb	
			10320usb	12133usb	13362usb		
0400	0500		USA, Family Radio Worldwide FL	6065na			
			6855na	7780va	9505na	9715na	
0400	0500		USA, KAIJ Dallas TX	5755na			
0400	0500		USA, KTBN Salt Lake City UT 7505na				
0400	0500		USA, KWHR Naalehu HI	17655as			
0400	0500		USA, Voice of America	4930af	4960af		
			6080af	9885af	15580af		
0400	0500		USA, WBCQ Monticello ME	5110na	7415na		
0400	0500		USA, WBOH Newport NC	5920am			
0400	0500		USA, WEWN Vandiver AL	5810va	5850va		
0400	0500		USA, WHRA Greenbush ME	5850na			
0400	0500	mtwhf	USA, WHRI Cypress Creek SC	5835am			
			7490am				
0400	0500	as	USA, WHRI Cypress Creek SC	7315am			
0400	0500		USA, WMLK Bethel PA	9265eu			
0400	0500		USA, WRMI Miami FL	9955na			
0400	0500		USA, WTJC Newport NC	9370na			
0400	0500		USA, WWCR Nashville TN	3215na	5070na		
			5765na	5935na			
0400	0500		USA, WWRB Manchester TN 3185oc	5050na			
			6890na				
0400	0500		Uzbekistan, CVC International	13685as			
0400	0500		Zambia, Christian Voice	4965do			
0430	0445		Israel, Kol Israel 6280va	7545va	9345va		
0430	0457		Czech Rep, Radio Prague 9890na				
0430	0500		Australia, Radio 9660as	12080as	13670as		
			15240pa	15415as	15515va	17750va	
			21725va				
0430	0500		Nigeria, Radio/Kaduna	6090do			
0430	0500		Swaziland, TWR 3200af	4775af			
0430	0500	a	USA, WWRB Manchester TN 5745ca				
0445	0500		Italy, RAI Italia 6110af	6145af	7235af		

0500 UTC - 1AM EDT / 12AM CDT / 10PM PDT

Start	Stop	Days	Station	Freq1	Freq2	Freq3	Freq4
0500	0507	twhfas	Canada, CBC NQ SW Service	9625na			
0500	0530	mtwhf	France, Radio France Intl	9805af	11995af		
			13680af				
0500	0530		Germany, Deutsche Welle	5945af	9700af		
0500	0530		Vatican City, Vatican Radio	7360af	9660af		
			11625af				
0500	0555		South Africa, Channel Africa 7240af	9685af			
0500	0600		Anguilla, University Network	6090am			
0500	0600		Armenia, CVC International 15515as				
0500	0600		Australia, ABC NT Alice Springs	2310do			
			4835do				
0500	0600		Australia, ABC NT Katherine 5025do				
0500	0600		Australia, ABC NT Tennant Creek	4910do			
0500	0600		Australia, Radio 9660as	12080as	13670as		
			15160as	15240pa	15515as	17750va	
0500	0600		Bhutan, BBS 6035as				
0500	0600		Canada, CFRX Toronto ON 6070na				
0500	0600		Canada, CKZN St John's NF 6160na				
0500	0600		Canada, CKZU Vancouver BC	6160na			
0500	0600		China, China Radio Intl	5960na	6190na		
			7220af	11880as	15350as	15465as	
			17505va	17540as	17725as	17855as	
0500	0600		Costa Rica, University Network	5030va			
			6150va	7375va	9725va		
0500	0600		Cuba, Radio Havana	6000na	6060na		

Right column:

Start	Stop	Days	Station	Freq1	Freq2	Freq3	Freq4
			6180na	9550va	9600va	11760va	
0500	0600		Germany, CVC International 9430af				
0500	0600		Guyana, Voice of 3291do				
0500	0600		Japan, Radio Japan/NHK World	5975eu			
			6110na	7230eu	15195as	17810as	
			21755pa				
0500	0600		Malaysia, RTM/Trax FM	7295as			
0500	0600		Malaysia, RTM/Voice of Malaysia	6175as			
			9750as	15295as			
0500	0600		New Zealand, Radio NZ Intl 9615pa				
0500	0600	DRM	New Zealand, Radio NZ Intl 9440pa				
0500	0600		Nigeria, Radio/Kaduna	4770do	6090al		
0500	0600		Nigeria, Voice of/ Ext. Svc Lagos	15120va			
0500	0600	vl	Papua New Guinea, Wantok R. Light	7120va			
0500	0600		Russia, Voice of 7150na	7255na	7350na		
			9840na	13735na			
0500	0600		Singapore, MediaCorp Radio	6150do			
0500	0600		Swaziland, TWR 4775af	6120af	9500af		
0500	0600	vl	Uganda, Radio 4976do	5026do			
0500	0600	DRM	UK, BBC World Service	1296eu			
0500	0600		UK, BBC World Service	3255af	6005as		
			6190af	6195af	7160af	9410eu	
			9440eu	11665af	11695as	11760as	
			11765af	11955as	12095eu	15310as	
			15575as	17640af	17760as	17790as	
			21660as				
0500	0600	mtwhf	UK, BBC World Service	15420af			
0500	0600	vl/ mtwhf	UK, Sudan Radio Service	9525af			
0500	0600		USA, American Forces Radio	4319usb			
			5446usb	5765usb	6350usb	7811usb	
			10320usb	12133usb	13362usb		
0500	0600		USA, Family Radio Worldwide FL	6855na			
			7520va				
0500	0600		USA, KAIJ Dallas TX	5755na			
0500	0600		USA, KTBN Salt Lake City UT 7505na				
0500	0600		USA, KWHR Naalehu HI	11565as	13650as		
0500	0600		USA, Voice of America	4930af	6080af		
			9885af	15580af			
0500	0600		USA, WBCQ Monticello ME	5110na	7415na		
0500	0600		USA, WBOH Newport NC	5920am			
0500	0600		USA, WEWN Vandiver AL	5850va	7570va		
0500	0600		USA, WHRA Greenbush ME 7555na				
0500	0600	mtwhf	USA, WHRI Cypress Creek SC	5835am			
			7490am				
0500	0600	as	USA, WHRI Cypress Creek SC	7315am			
0500	0600		USA, WMLK Bethel PA	9265eu			
0500	0600		USA, WRMI Miami FL	9955va			
0500	0600		USA, WTJC Newport NC	9370na			
0500	0600		USA, WWCR Nashville TN	3215na	5070na		
			5765na	5935na			
0500	0600		USA, WWRB Manchester TN 3185oc	5085na			
0500	0600		Uzbekistan, CVC International	13685as			
0500	0600		Zambia, Christian Voice	5915al	6065af		
0515	0530		Rwanda, Radio 6055do				
0525	0600	vl	Ghana, Ghana BC Corp	4915do			
0530	0600		Romania, Radio Romania Intl	9655va			
			11830va	15435va	17770va		
0530	0600	vl	Rwanda, Radio 6055do				
0530	0600		Thailand, Radio 13770eu				

0600 UTC - 2AM EDT / 1AM CDT / 11PM PDT

Start	Stop	Days	Station	Freq1	Freq2	Freq3	Freq4
0600	0615	as	South Africa, TWR	11640af			
0600	0620		Vatican City, Vatican Radio	4005eu	7250eu		
0600	0630		Australia, Radio 9660as	12080as	13670as		
			15160as	15240pa	15515as	17750va	
0600	0630	mtwhf	France, Radio France Intl	7315af	9865af		
			11995af	13680af	15160af	17770af	
0600	0630		Germany, Deutsche Welle	7310af	15275af		
0600	0630		Nigeria, Radio, Natl Svc/Abuja	7275do			
0600	0630		USA, Voice of America	6080af	6105af		
			9885af	15580af			
0600	0645	mtwhf	South Africa, TWR	11640af			
0600	0658		New Zealand, Radio NZ Intl 9615pa				
0600	0658	DRM	New Zealand, Radio NZ Intl 9890pa				
0600	0700		Anguilla, University Network	6090am			
0600	0700		Armenia, CVC International 15515as				
0600	0700		Australia, ABC NT Alice Springs	2310do			
			4835do				
0600	0700		Australia, ABC NT Katherine 5025do				
0600	0700		Australia, ABC NT Tennant Creek	4910do			
0600	0700		Australia, CVC International 15335as				
0600	0700		Canada, CFRX Toronto ON 6070na				
0600	0700		Canada, CFVP Calgary AB 6030na				
0600	0700		Canada, CKZN St John's NF 6160na				
0600	0700		Canada, CKZU Vancouver BC	6160na			
0600	0700		China, China Radio Intl	6115na	11750af		
			11770as	11880as	13645as	15140na	
			15350as	15465as	17505va	17540as	
			17710as				
0600	0700		Costa Rica, University Network	5030va			
			6150va	7375va	9725va	11870va	

0600	0700		Cuba, Radio Havana	6000va	6060va	
			6180na	9550va	9600va	11760va
0600	0700		Germany, CVC International	11720af		
0600	0700	vl	Ghana, Ghana BC Corp	4915do		
0600	0700		Greece, Voice of 11645eu			
0600	0700		Guyana, Voice of 3291do			
0600	0700		Japan, Radio Japan/NHK World	7230eu		
			11690va	11715eu	11740as	17870pa
0600	0700	vl	Liberia, ELWA 4760do			
0600	0700		Malaysia, RTM/Trax FM	7295as		
0600	0700		Malaysia, RTM/Voice of Malaysia	6175as		
			9750as	15295as		
0600	0700		Nigeria, Radio/Kaduna	4770do	6090al	
0600	0700		Nigeria, Voice of/ Ext. Svc Lagos	15120va		
0600	0700	vl	Papua New Guinea, Wantok R. Light	7120va		
0600	0700		Russia, Voice of 11575eu	17665oc	17805oc	
0600	0700		Singapore, MediaCorp Radio	6150do		
0600	0700	vl	Solomon Islands, SIBC	5020do	9545do	
0600	0700		South Africa, Channel Africa 7240af	15255af		
0600	0700		Swaziland, TWR 4775af	6120af	9500af	
0600	0700	DRM	UK, BBC World Service	1296eu		
0600	0700		UK, BBC World Service	6005af	6190af	
			6195eu	7160eu	9410eu	11675as
			11940af	12095eu	11765af	11955as
			15360as	15420af	15575as	17640af
			17760as	17790as	21660as	
0600	0700		USA, American Forces Radio		4319usb	
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
0600	0700		USA, Family Radio Worldwide FL	5945am		
			6000am	7780va	9860na	11580af
			11630va			
0600	0700		USA, KAIJ Dallas TX	5755na		
0600	0700		USA, KTBN Salt Lake City UT	7505na		
0600	0700		USA, KWHR Naalehu HI	11565as	13650as	
0600	0700		USA, WBCQ Monticello ME	5110na	7415na	
0600	0700		USA, WBOH Newport NC	5920am		
0600	0700		USA, WEWN Vandiver AL	5850va	7570va	
0600	0700		USA, WHRA Greenbush ME 7555na			
0600	0700	twhfa	USA, WHRI Cypress Creek SC		5835am	
0600	0700		USA, WHRI Cypress Creek SC		7315am	
			7490am			
0600	0700		USA, WMLK Bethel PA	9265eu		
0600	0700		USA, WRMI Miami FL	9955va		
0600	0700		USA, WTJC Newport NC	9370am		
0600	0700		USA, WWCR Nashville TN	3215na	5070na	
			5765na	5935na		
0600	0700		USA, WWRB Manchester TN 3185oc	5085na		
0600	0700	vl	Vanuatu, Radio 4960do			
0600	0700		Yemen, Rep of Yemen Radio 9780me			
0600	0700		Zambia, Christian Voice	5915al	6065af	
0605	0620	m	Austria, Radio Austria Intl	17870me		
0605	0630	Sat/Sun	Austria, Radio Austria Intl	17870me		
0630	0700		Australia, Radio 9660as	12080as	13670as	
			15160as	15240pa	15415as	15515as
			17750va			
0630	0700		Bulgaria, Radio 9600eu	11600eu		
0630	0700		UK, BBC World Service	11795af		
0630	0700		USA, Voice of America	6080af	9885af	
			15580af			
0630	0700		Vatican City, Vatican Radio	7360af	9660af	
			11625af			
0635	0700	Sat/Sun	Austria, Radio Austria Intl	17870me		
0645	0700	Sun	Albania, TWR Europe	11865eu		
0645	0700	twhf	Austria, Radio Austria Intl	17870me		
0645	0700	Sun	Monaco, TWR Europe	9800eu		
0659	0700	DRM	New Zealand, Radio NZ Intl 7145pa			

0700 UTC - 3AM EDT / 2AM CDT / 12AM PDT

0700	0705		Croatia, Croatian Radio	9470oc	11690oc	
0700	0706		UK, BBC World Service	6005af		
0700	0730		France, Radio France Intl	11725af	15605af	
0700	0730		Slovakia, Radio Slovakia Int 9440pa	15460pa		
0700	0800	mtwhfs	Albania, TWR Europe	11865eu		
0700	0800		Anguilla, University Network		6090am	
0700	0800		Australia, ABC NT Alice Springs		2310do	
			4835do			
0700	0800		Australia, ABC NT Katherine 5025do			
0700	0800		Australia, ABC NT Tennant Creek		4910do	
0700	0800		Australia, CVC International 15335as			
0700	0800		Australia, CVC International 15335as			
0700	0800		Australia, Radio 9660as	9710as	12080as	
			13630as	15160pa	15240pa	15415as
			17750va			
0700	0800		Canada, CFRX Toronto ON 6070na			
0700	0800		Canada, CFVP Calgary AB	6030na		
0700	0800		Canada, CKZN St John's NF 6160na			
0700	0800		Canada, CKZU Vancouver BC		6160na	
0700	0800		China, China Radio Intl	11785eu	11880as	
			13645as	15465as	17490eu	17540as

			17790as			
0700	0800		Costa Rica, University Network		5030va	
			6150va	7375va	9725va	11870va
0700	0800		Germany, CVC International 15640af			
0700	0800	vl	Ghana, Ghana BC Corp	4915do		
0700	0800		Guyana, Voice of 3291do	5950do		
0700	0800	vl	Liberia, ELWA 4760do			
0700	0800		Liberia, Star Radio	9525af		
0700	0800		Malaysia, RTM/Trax FM	7295as		
0700	0800		Malaysia, RTM/Voice of Malaysia	6175as		
			9750as	15295as		
0700	0800	mtwhf	Monaco, TWR Europe	9800eu		
0700	0800		Myanmar, Radio 9730do			
0700	0800		New Zealand, Radio NZ Intl 6095pa			
0700	0800		New Zealand, Radio NZ Intl 6095pa			
0700	0800	DRM	New Zealand, Radio NZ Intl 7145pa			
0700	0800		Nigeria, Radio/Kaduna	4770do	6090al	
0700	0800		Nigeria, Voice of/ Ext. Svc Lagos	15120va		
0700	0800	vl	Papua New Guinea, Wantok R. Light	7120va		
0700	0800		Russia, Voice of 17665oc	17805oc		
0700	0800	DRM	Russia, Voice of 11615eu			
0700	0800		Singapore, MediaCorp Radio	6150do		
0700	0800	vl	Solomon Islands, SIBC	5020do	9545do	
0700	0800	vl	South Africa, Channel Africa 9620af			
0700	0800	Sat/Sun	Swaziland, TWR 4775af			
0700	0800		Swaziland, TWR 6120af	9500af		
0700	0800		Taiwan, Radio Taiwan Intl	5950am		
0700	0800	mtwhf	UK, BBC World Service	15400af		
0700	0800		UK, BBC World Service	5875af	6190af	
			6195eu	7320eu	9410eu	11695as
			11760me	11765af	11795eu	11940af
			11955as	12095eu	15360as	15420af
			15575as	17790as		
0700	0800		USA, American Forces Radio		4319usb	
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
0700	0800		USA, Family Radio Worldwide FL		6855na	
			7455na	7780va	9495am	9715na
			9985af			
0700	0800		USA, KAIJ Dallas TX	5755na		
0700	0800		USA, KTBN Salt Lake City UT	7505na		
0700	0800		USA, KWHR Naalehu HI	11565as	13650as	
0700	0800		USA, WBCQ Monticello ME	5110na	7415na	
0700	0800		USA, WBOH Newport NC	5920am		
0700	0800		USA, WEWN Vandiver AL	5850va	7570va	
0700	0800		USA, WHRA Greenbush ME 7465na			
0700	0800	twhfa	USA, WHRI Cypress Creek SC		5835am	
0700	0800		USA, WHRI Cypress Creek SC		7315am	
			7490am			
0700	0800		USA, WMLK Bethel PA	9265eu		
0700	0800		USA, WRMI Miami FL	9955va		
0700	0800		USA, WTJC Newport NC	9370na		
0700	0800		USA, WWCR Nashville TN	3215na	5070na	
			5765na	5935na		
0700	0800		USA, WWRB Manchester TN 3185oc	5085na		
0700	0800	vl	Vanuatu, Radio 4960do			
0700	0800		Zambia, Christian Voice	5915al	6065af	
0715	0750	Sat	Albania, TWR Europe	11865eu		
0715	0750	Sat	Monaco, TWR Europe	9800eu		
0730	0745	mtwhfa	Vatican City, Vatican Radio	4005eu	6185eu	
			7250eu	9645eu	11740eu	15595va
0730	0800		Australia, HCJB Global	11750pa		
0730	0800		Pakistan, Radio 15100eu	17835eu		

0800 UTC - 4AM EDT / 3AM CDT / 1AM PDT

0800	0820	mtwhfs	Albania, TWR Europe	11865eu		
0800	0820	mtwhfs	Monaco, TWR Europe	9800eu		
0800	0825		Malaysia, RTM/Voice of Malaysia	6175as		
			9750as	15295as		
0800	0827		Czech Rep, Radio Prague	7345eu	9860eu	
0800	0830		Australia, ABC NT Katherine 5025do			
0800	0830		Australia, ABC NT Tennant Creek		4910do	
0800	0830		Myanmar, Radio 9730do			
0800	0830		Pakistan, Radio 15100eu	17835eu		
0800	0845	Sat	Guam, TWR/KTWR	11840pa		
0800	0900		Anguilla, University Network		6090am	
0800	0900		Australia, ABC NT Alice Springs		2310do	
			4835do			
0800	0900		Australia, CVC International 15335as			
0800	0900		Australia, HCJB Global	11750pa		
0800	0900		Australia, Radio 5995va	9580va	9710va	
			12080as	13630va	15415as	17750va
0800	0900		Canada, CFRX Toronto ON 6070na			
0800	0900		Canada, CFVP Calgary AB 6030na			
0800	0900		Canada, CKZN St John's NF 6160na			
0800	0900		Canada, CKZU Vancouver BC		6160na	
0800	0900		China, China Radio Intl	9415as	11785eu	
			11880as	15350as	15465as	17490eu
			17540as			
0800	0900		Costa Rica, University Network		5030va	
			6150va	7375va	9725va	11870va

Start	Stop	Days	Station	Frequencies
0800	0900		Germany, CVC International	15640af
0800	0900	vl	Ghana, Ghana BC Corp	4915do
0800	0900	vl	Greece, Voice of	9420eu 15630eu
0800	0900	mtwhf	Guam, TWR/KTWR	11840pa
0800	0900		Guyana, Voice of 3291do	5950do
0800	0900		Indonesia, Voice of	9525as 11785pa 15150al
0800	0900	a	Latvia, Radio SWH	9290eu
0800	0900	vl	Liberia, ELWA 4760do	
0800	0900		Malaysia, RTM/Trax FM	7295as
0800	0900		New Zealand, Radio NZ Intl	6095pa
0800	0900	DRM	New Zealand, Radio NZ Intl	7145pa
0800	0900		Nigeria, Radio/Kaduna	4770do 6090al
0800	0900		Papua New Guinea, Catholic Radio	4960do
0800	0900		Papua New Guinea, NBC	4890do
0800	0900	vl	Papua New Guinea, Wantok R. Light	7120va
0800	0900		Russia, Voice of	15195as 17495oc 17665oc 17805oc
0800	0900	DRM	Russia, Voice of	12060eu
0800	0900		Singapore, MediaCorp Radio	6150do
0800	0900	vl	Solomon Islands, SIBC	5020do 9545do
0800	0900	vl	South Africa, Channel Africa	9620af
0800	0900		South Korea, KBS World Radio	9570as 9640eu
0800	0900		Swaziland, TWR 6120af	9500af
0800	0900		Taiwan, Radio Taiwan Intl	9610as
0800	0900	DRM	UK, BBC World Service	1296eu
0800	0900		UK, BBC World Service	5875eu 6190af 6195eu 7320eu 9740as 11760va 11940af 12095eu 15285as 17790as 17885af 21470af 21660as
0800	0900	mtwhf	UK, BBC World Service	15400af 17830af
0800	0900	Sat/Sun	UK, BBC World Service	15575as 17830af
0800	0900	f	UK, Bible Voice 5945eu	
0800	0900	a	UK, Bible Voice 5945eu	
0800	0900	s	UK, Bible Voice 5945eu	
0800	0900		USA, American Forces Radio	4319usb 5446usb 5765usb 6350usb 7811usb 10320usb 12133usb 13362usb
0800	0900		USA, Family Radio Worldwide FL	5950na 6855na 7455na
0800	0900		USA, KAIJ Dallas TX	5755na
0800	0900		USA, KNLS Anchor Point AK	7355as
0800	0900		USA, KTBN Salt Lake City UT	7505na
0800	0900		USA, KWHR Naalehu HI	9930as 11565as
0800	0900		USA, WBOH Newport NC	5920am
0800	0900		USA, WEWN Vandiver AL	5850na
0800	0900		USA, WHRA Greenbush ME	7465na
0800	0900	twhfa	USA, WHRI Cypress Creek SC	5835am
0800	0900		USA, WHRI Cypress Creek SC	7315 an 7490am
0800	0900		USA, WMLK Bethel PA	9265eu
0800	0900		USA, WRMI Miami FL	9955va
0800	0900		USA, WTJC Newport NC	9370na
0800	0900		USA, WWCR Nashville TN	3215na 5070na 5765na 5935na
0800	0900		USA, WWRB Manchester TN 3185oc	5085na
0800	0900	vl	Vanuatu, Radio 4960do	
0800	0900		Zambia, Christian Voice	5915al 6065af
0805	0900	mtwhf	Guam, TWR/KTWR	15170as
0830	0900		Australia, ABC NT Katherine 2485do	
0830	0900		Australia, ABC NT Tennant Creek	2325do

0900 UTC - 5AM EDT / 4AM CDT / 2AM PDT

Start	Stop	Days	Station	Frequencies
0900	0900		USA, WBCQ Monticello ME	5110na 7415na
0900	0915	s	UK, Bible Voice 5945eu	
0900	0930		Australia, HCJB Global	11750pa
0900	0945	s	UK, Bible Voice 5945eu	
0900	1000		Anguilla, University Network	6090am
0900	1000		Australia, ABC NT Alice Springs	2310do 4835do
0900	1000		Australia, ABC NT Katherine 2485do	
0900	1000		Australia, ABC NT Tennant Creek	2325do
0900	1000		Australia, CVC International 11955as	
0900	1000		Australia, Radio 9580va	9590va 15415as
0900	1000		Bhutan, BBS	6035as
0900	1000		Canada, CFRX Toronto ON	6070na
0900	1000		Canada, CFVP Calgary AB	6030na
0900	1000		Canada, CKZN St John's NF 6160na	
0900	1000		Canada, CKZU Vancouver BC	6160na
0900	1000		China, China Radio Intl	9415as 15210as 15350as 17490eu 17690as 17750as
0900	1000		Costa Rica, University Network	5030va 6150va 7375va 9725va 11870va 13750va
0900	1000		Germany, Deutsche Welle	15340as 17770as
0900	1000	vl	Ghana, Ghana BC Corp	4915do
0900	1000	vl	Greece, Voice of	9420eu 15630eu
0900	1000		Guyana, Voice of 3291do	5950do
0900	1000	Sat/Sun	Italy, IRRS	9310eu 13840eu
0900	1000	vl	Liberia, ELWA	4760do
0900	1000		Malaysia, RTM/Trax FM	7295as
0900	1000		New Zealand, Radio NZ Intl	6095pa
0900	1000	DRM	New Zealand, Radio NZ Intl	7145pa
0900	1000		Nigeria, Radio/Kaduna	4770do 6090al
0900	1000		Papua New Guinea, Catholic Radio	4960do
0900	1000		Papua New Guinea, NBC	4890do
0900	1000	vl	Papua New Guinea, Wantok R. Light	7120va
0900	1000		Russia, Voice of	17495oc 17665oc
0900	1000	DRM	Russia, Voice of	11615eu
0900	1000		Saudi Arabia, BSKSA	15250as 15470as
0900	1000		Singapore, MediaCorp Radio	6150do
0900	1000	vl	Solomon Islands, SIBC	5020do 9545do
0900	1000	vl	South Africa, Channel Africa	9620af
0900	1000	DRM	UK, BBC World Service	1296eu
0900	1000	mtwhf	UK, BBC World Service	15400af 15575as 17830af
0900	1000		UK, BBC World Service	5975as 6190af 6195as 7320eu 9470eu 9740as 11760me 11940af 12095eu 15285as 15485eu 17760as 17790as 17885af 21470af 21660as
0900	1000	Sat/Sun	UK, BBC World Service	15575as 17830af
0900	1000		USA, American Forces Radio	4319usb 5446usb 5765usb 6350usb 7811usb 10320usb 12133usb 13362usb
0900	1000		USA, Family Radio Worldwide FL	5950na 6885na 7455na 9460va
0900	1000		USA, KAIJ Dallas TX	5755na
0900	1000		USA, KTBN Salt Lake City UT	7505na
0900	1000		USA, KWHR Naalehu HI	9930as 11565as
0900	1000		USA, WBCQ Monticello ME	5110na 7415na
0900	1000		USA, WBOH Newport NC	5920am
0900	1000		USA, WEWN Vandiver AL	5850na
0900	1000		USA, WHRI Cypress Creek SC	7315am 7520am
0900	1000		USA, WRMI Miami FL	9955va
0900	1000		USA, WTJC Newport NC	9370na
0900	1000		USA, WWCR Nashville TN	3215na 5070na 5765na 5935na
0900	1000		USA, WWRB Manchester TN	3185oc 5085na
0900	1000	vl	Vanuatu, Radio 4960do	
0900	1000		Zambia, Christian Voice	5915al 6065af
0930	1000		Lithuania, Radio Vilnius	9710eu

1000 UTC - 6AM EDT / 5AM CDT / 3AM PDT

Start	Stop	Days	Station	Frequencies
1000	1027		Czech Rep, Radio Prague	9955am 15710as 21745af
1000	1030		UK, BBC World Service	5975as 15285as 21660as
1000	1058		New Zealand, Radio NZ Intl 6095pa	
1000	1100		Anguilla, University Network	11775am
1000	1100		Australia, ABC NT Alice Springs	2310do 4835do
1000	1100		Australia, ABC NT Katherine 2485do	
1000	1100		Australia, ABC NT Tennant Creek	2325do
1000	1100		Australia, CVC International 11955as	
1000	1100		Australia, HCJB Global 15540va	
1000	1100		Australia, Radio 9580va	9590va 15415as
1000	1100	DRM	Austria, CVC International 9760eu	
1000	1100		Canada, CFRX Toronto ON 6070na	
1000	1100		Canada, CFVP Calgary AB 6030na	
1000	1100		Canada, CKZN St John's NF 6160na	
1000	1100		Canada, CKZU Vancouver BC	6160na
1000	1100		China, China Radio Intl	5955as 7135as 7215as 13590as 13720as 15190as 15210as 15350as 17490eu 17690as 17750as
1000	1100		Costa Rica, University Network	5030va 6150va 7375va 9725va 11870va 13750va
1000	1100	vl	Ghana, Ghana BC Corp	4915do
1000	1100		Guyana, Voice of 3291do	5950do
1000	1100		India, All India Radio	13710oc 15020as 15235as 17510pa 17800as 17895pa
1000	1100	Sat/Sun	Italy, IRRS	9310eu 13840eu
1000	1100		Japan, Radio Japan/NHK World	6120na 9695as 11730as 17585va 17720me 21755oc
1000	1100	vl	Liberia, ELWA 4760do	
1000	1100		Malaysia, RTM/Trax FM	7295as
1000	1100		Netherlands, Radio	13710as 12065as 13820as
1000	1100	DRM	New Zealand, Radio NZ Intl 7145pa	
1000	1100		Nigeria, Radio/Kaduna	4770do 6090al
1000	1100		Nigeria, Voice of/ Ext. Svc Lagos	7255af
1000	1100		North Korea, Voice of Korea	6185as 6285am 9850as
1000	1100		Papua New Guinea, Catholic Radio	4960do
1000	1100		Papua New Guinea, NBC	4890do

Start	End	Days	Station	Freq	Freq	Freq	Freq
1000	1100	vl	Papua New Guinea, Wantok R. Light	7120va			
1000	1100		Saudi Arabia, BSKSA	15250as	15470as		
1000	1100		Singapore, MediaCorp Radio	6150do			
1000	1100	vl	Solomon Islands, SIBC	5020do	9545do		
1000	1100	vl	South Africa, Channel Africa	9620af			
1000	1100	DRM	UK, BBC World Service	1296eu			
1000	1100		UK, BBC World Service	6190af	6195as		
				7320eu	9470eu	9740eu	11760me
				11940af	11945as	15485eu	15575as
				17640eu	17790as	17885af	21470af
1000	1100	Sat/Sun	UK, BBC World Service	17830af			
1000	1100		USA, American Forces Radio	4319usb			
				5446usb	5765usb	6350usb	7811usb
				10320usb	12133usb	13362usb	
1000	1100		USA, Family Radio Worldwide FL	5950na			
				6855na	6890na	7455na	9460va
1000	1100		USA, KAIJ Dallas TX	5755na			
1000	1100		USA, KNLS Anchor Point AK	7355as			
1000	1100		USA, KTBN Salt Lake City UT	7505na			
1000	1100		USA, KWHR Naalehu HI	9930as	11565as		
1000	1100		USA, WBCQ Monticello ME	5110na	7415na		
1000	1100		USA, WBOH Newport NC	5920am			
1000	1100		USA, WEWN Vandiver AL	5850na			
1000	1100		USA, WHRI Cypress Creek SC	7315am			
				7520am			
1000	1100		USA, WRMI Miami FL	9955va			
1000	1100		USA, WTJC Newport NC	9370na			
1000	1100		USA, WWCR Nashville TN	5070na	5765na		
				5935na	9985na		
1000	1100		USA, WWRB Manchester TN	3185oc	5085na		
1000	1100		Zambia, Christian Voice	5915al	6065af		
1030	1045		Israel, Kol Israel	15760eu	17535eu		
1030	1058		Vietnam, Voice of	7285as			
1030	1100		Iran, Voice of the Islamic Rep	15460as			
				17660as			
1030	1100	Sat/Sun	Italy, IRRS	9310va			
1030	1100		UK, BBC World Service	9605as	11750as		
				15285as	15545as		
1030	1100	s	UK, Bible Voice	5950as			
1059	1100		New Zealand, Radio NZ Intl	9870pa			

1100 UTC - 7AM EDT / 6AM CDT / 4AM PDT

Start	End	Days	Station	Freq	Freq	Freq	Freq
1100	1105		Pakistan, Radio	15100as	17835as		
1100	1127		Iran, Voice of the Islamic Rep	15460as			
				17600as			
1100	1128		Vietnam, Voice of	9840as	7220as	7285as	
1100	1130		Australia, HCJB Global	15540va			
1100	1130	mtwhf	UK, BBC World Service	6130am			
1100	1158	DRM	New Zealand, Radio NZ Intl	7145pa			
1100	1200		Anguilla, University Network	11775am			
1100	1200		Australia, ABC NT Alice Springs	2310do			
				4835do			
1100	1200		Australia, ABC NT Katherine	2485do			
1100	1200		Australia, ABC NT Tennant Creek	2325do			
1100	1200		Australia, CVC International	13635as			
1100	1200		Australia, Radio	5995va	6020va	9475as	
				9560pa	9580va	9590va	12080as
1100	1200	Sat/Sun	Canada, CBC NQ SW Service	9625na			
1100	1200		Canada, CFRX Toronto ON	6070na			
1100	1200		Canada, CFVP Calgary AB	6030na			
1100	1200		Canada, CKZN St John's NF	6160na			
1100	1200		Canada, CKZU Vancouver BC	6160na			
1100	1200		China, China Radio Intl	5955as	5960na		
				9570as	11650as	11795as	13590as
				13645as	13665eu	13720as	17490eu
1100	1200		Costa Rica, University Network	5030va			
				6150va	7375va	9725va	11870va
				13750va			
1100	1200	s	Germany, Universal Life	6055me			
1100	1200	vl	Ghana, Ghana BC Corp	4915do			
1100	1200	Sat/Sun	Italy, IRRS	9310eu	15735eu		
1100	1200		Japan, Radio Japan/NHK World	6120na			
				9695as	11730as		
1100	1200	vl	Liberia, ELWA	4760do			
1100	1200		Malaysia, RTM/Trax FM	7295as			
1100	1200		Netherlands, Radio	11675na			
1100	1200		New Zealand, Radio NZ Intl	9870pa			
1100	1200		Nigeria, Radio/Kaduna	4770do	6090al		
1100	1200		Nigeria, Voice of/ Ext. Svc Lagos	7255af			
1100	1200		Papua New Guinea, Catholic Radio	4960do			
1100	1200		Papua New Guinea, NBC	4890do			
1100	1200	vl	Papua New Guinea, Wantok R. Light	7120va			
1100	1200		Saudi Arabia, BSKSA	15250as	15470as		
1100	1200		Singapore, Radio Singapore Intl	6080as			
				6150as			
1100	1200	vl	South Africa, Channel Africa	9620af			
1100	1200	DRM	UK, BBC World Service	1296eu			
1100	1200	Sat/Sun	UK, BBC World Service	5875am	6130am		
1100	1200	Sat/Sun	UK, BBC World Service	6190af	6195as		
				7320eu	9470eu	9740as	11760me
				11940af	11945as	15485eu	15575as
				17640eu	17790as	17830af	17885af
				21470af			
1100	1200	Sat/Sun	UK, Bible Voice	5950as			
1100	1200		Ukraine, Radio Ukraine Intl	15675eu			
1100	1200		USA, American Forces Radio	4319usb			
				5446usb	5765usb	6350usb	7811usb
				10320usb	12133usb	13362usb	
1100	1200		USA, Family Radio Worldwide FL	5950na			
				6890na	7780na	11725am	11725na
				11830na			
1100	1200		USA, KAIJ Dallas TX	5755na			
1100	1200		USA, KTBN Salt Lake City UT	7505na			
1100	1200		USA, KWHR Naalehu HI	9930as	11565as		
1100	1200		USA, WBOH Newport NC	5920am			
1100	1200		USA, WEWN Vandiver AL	5850na			
1100	1200		USA, WHRI Cypress Creek SC	5875am			
				7315am			
1100	1200		USA, WINB Red Lion PA	9265am			
1100	1200		USA, WRMI Miami FL	9955va			
1100	1200		USA, WTJC Newport NC	9370na			
1100	1200		USA, WWCR Nashville TN	5070na	5765na		
				5935na	15825na		
1100	1200		USA, WWRB Manchester TN	3185oc	5085na		
1100	1200		Zambia, Christian Voice	5915al	6065af		
1115	1130	mtwhf	UK, Bible Voice	5950as			
1130	1145		UK, BBC World Service	7135as	11920as		
1130	1157		Czech Rep, Radio Prague	11640eu	17545va		
1130	1200		Australia, HCJB Global	15400va			
1130	1200	mtwhfa	Australia, HCJB Global	15425va			
1130	1200		Bulgaria, Radio	11700eu	15700eu		
1130	1200	a	Germany, Universal Life	6055me			
1130	1200		Guam, AWR/KSDA	15435as			
1130	1200	mtwhf	UK, BBC World Service	5875am	6130am		
1130	1200		Vatican City, Vatican Radio	15595va	17765va		

1200 UTC - 8AM EDT / 7AM CDT / 5AM PDT

Start	End	Days	Station	Freq	Freq	Freq	Freq
1200	1215	f	UK, Bible Voice	5950as			
1200	1230	Sun	Australia, HCJB Global	15425va			
1200	1230		France, Radio France Intl	15275af	17815af		
				21620af			
1200	1230		Germany, AWR Europe	15320as			
1200	1258		New Zealand, Radio NZ Intl	9870pa			
1200	1259		Canada, Radio Canada Intl	9660as	15170as		
1200	1300		Anguilla, University Network	11775am			
1200	1300		Australia, ABC NT Alice Springs	2310do			
				4835do			
1200	1300		Australia, ABC NT Katherine	2485do			
1200	1300		Australia, ABC NT Tennant Creek	2325do			
1200	1300		Australia, CVC International	13635as			
1200	1300		Australia, Radio	5995va	6020va	9475as	
				9560pa	9580va	9590va	
1200	1300	Sat/Sun	Canada, CBC NQ SW Service	9625na			
1200	1300		Canada, CFRX Toronto ON	6070na			
1200	1300		Canada, CFVP Calgary AB	6030na			
1200	1300		Canada, CKZN St John's NF	6160na			
1200	1300		Canada, CKZU Vancouver BC	6160na			
1200	1300		China, China Radio Intl	5955as	7250as		
				9460as	9730as	9760as	11650as
				11690as	11980as	12080as	13655eu
				13790eu	17490eu		
1200	1300		Costa Rica, University Network	9725va			
				11870va	13750va		
1200	1300		Germany, CVC International	15715me			
1200	1300	Sat/Sun	Germany, Universal Life	6045me			
1200	1300	vl	Ghana, Ghana BC Corp	4915do			
1200	1300	Sat/Sun	Italy, IRRS	9310af	15735eu		
1200	1300	f	Italy, IRRS	15750va			
1200	1300		Malaysia, RTM/Trax FM	7295as			
1200	1300	DRM	New Zealand, Radio NZ Intl	7145pa			
1200	1300		Nigeria, Radio/Kaduna	4770do	6090al		
1200	1300		Nigeria, Voice of/ Ext. Svc Lagos	7255af			
1200	1300		Papua New Guinea, Catholic Radio	4960do			
1200	1300		Papua New Guinea, NBC	4890do			
1200	1300	vl	Papua New Guinea, Wantok R. Light	7120va			
1200	1300		Romania, Radio Romania Intl	11875eu			
				15220eu			
1200	1300		Singapore, Radio Singapore Intl	6080as			
				6150as			
1200	1300	vl	South Africa, Channel Africa	9620af			
1200	1300		South Korea, KBS World Radio	9650na			
1200	1300		UAE, AWR Africa	15140as			
1200	1300	DRM	UK, BBC World Service	1296eu			
1200	1300		UK, BBC World Service	5975va	6190af		
				6195as	7320eu	9470eu	9660am
				9740as	9750am	11760me	11895as
				11940as	15310as	15485eu	15575as
				17640eu	17790as	17830af	17885af
				21470af			
1200	1300		USA, American Forces Radio	4319usb			

Start	End	Days	Station	Freq	Freq	Freq	Freq
				5446usb	5765usb	6350usb	7811usb
				10320usb	12133usb	13362usb	
1200	1300		USA, Family Radio Worldwide FL				6890na
			7780na	11530am	11970na		
1200	1300		USA, KAIJ Dallas TX	5755na			
1200	1300		USA, KNLS Anchor Point AK	7355as	9920as		
1200	1300		USA, KTBN Salt Lake City UT	7505na			
1200	1300		USA, KWHR Naalehu HI	11565as	12130as		
1200	1300		USA, Voice of America	9645va	9760va		
			11705va	11730va	15190va		
1200	1300		USA, WBOH Newport NC	5920am			
1200	1300		USA, WEWN Vandiver AL	9955na			
1200	1300		USA, WHRA Greenbush ME	15665na			
1200	1300		USA, WHRI Cypress Creek SC				7520am
			9660am				
1200	1300		USA, WINB Red Lion PA	9265am			
1200	1300		USA, WRMI Miami FL	9955va			
1200	1300		USA, WTJC Newport NC	9370na			
1200	1300		USA, WWCR Nashville TN	5070na	5765na		
			5935na	15825na			
1200	1300		USA, WWRB Manchester TN	9385na			
1200	1300	DRM	Vatican City, Vatican Radio	13770am			
1200	1300		Zambia, Christian Voice	5915al	6065af		
1215	1300		Egypt, Radio Cairo	17835as			
1230	1258		Vietnam, Voice of 9840as	12020as			
1230	1300		Bangladesh, Bangla Betar	7185as			
1230	1300		Sweden, Radio 13580va	15240na	15735va		
1230	1300		Thailand, Radio 9810oc				
1230	1300		Turkey, Voice of 15450eu	13685va			
1230	1300		UK, BBC World Service	17735af			
1245	1300	Sat	Australia, HCJB Global	15425va			
1255	1258		Finland, YLE/Radio Finland	13715do	15400do		

1300 UTC - 9AM EDT / 8AM CDT / 6AM PDT

Start	End	Days	Station	Freq	Freq	Freq	Freq
1300	1300		Germany, CVC International 15715me				
1300	1325		Turkey, Voice of 15450eu	13685va			
1300	1330		Egypt, Radio Cairo	17835as			
1300	1350	s	Italy, IRRS	15735as			
1300	1359		Poland, Polish Radio	5975eu	9525eu		
1300	1400		Anguilla, University Network				11775am
1300	1400		Australia, CVC International 13635as				
1300	1400		Australia, Radio 5995va	6020va	9560va		
			9580va	9590va			
1300	1400	Sat/Sun	Canada, CBC NQ SW Service				9625na
1300	1400		Canada, CFRX Toronto ON 6070na				
1300	1400		Canada, CFVP Calgary AB 6030na				
1300	1400		Canada, CKZN St John's NF 6160na				
1300	1400		Canada, CKZU Vancouver BC				6160na
1300	1400		China, China Radio Intl	5955as	7300as		
			9570na	9655as	9730as	9765as	
			9870as	11760as	11885na	11900as	
			11980as	13610eu	13790eu	15230na	
1300	1400		Costa Rica, University Network	9725va			
			11870va	13750va			
1300	1400		Germany, Overcomer Ministries				6110na
1300	1400	vl	Ghana, Ghana BC Corp	4915do			
1300	1400	vl	Greece, Voice of 9420eu	15630eu			
1300	1400	s	Latvia, Radio SWH	9290eu			
1300	1400		Malaysia, RTM/Trax FM	7295as			
1300	1400	DRM	New Zealand, Radio NZ Intl 7145pa				
1300	1400		New Zealand, Radio NZ Intl 6095pa				
1300	1400		Nigeria, Radio/Kaduna	4770do	6090al		
1300	1400		Nigeria, Voice of/ Ext. Svc Lagos	7255af			
1300	1400		North Korea, Voice of Korea 7570eu	9335na			
			11710na	12015na			
1300	1400		Papua New Guinea, Catholic Radio	4960do			
1300	1400		Papua New Guinea, NBC 4890do				
1300	1400	vl	Papua New Guinea, Wantok R. Light	7120va			
1300	1400		Singapore, Radio Singapore Intl	6080as			
			6150as				
1300	1400	vl	South Africa, Channel Africa 9620af				
1300	1400		South Korea, KBS World Radio	9570na			
			9770na				
1300	1400	DRM	UK, BBC World Service	1296eu			
1300	1400		UK, BBC World Service	5975as	6190af		
			6195as	7320eu	9470eu	9740as	
			11760me	11895as	11940af	15310as	
			15420af	15485as	15575as	17640eu	
			17790af	17830af	17885af	21470af	
1300	1400		USA, American Forces Radio				4319usb
			5446usb	5765usb	6350usb	7811usb	
			10320usb	12133usb	13362usb		
1300	1400		USA, Family Radio Worldwide FL				5865as
			7495as	7780as	11560na	11855na	
			11970na				
1300	1400		USA, KAIJ Dallas TX	5755na			
1300	1400		USA, KTBN Salt Lake City UT 7505na				
1300	1400		USA, KWHR Naalehu HI	12130as			
1300	1400		USA, Voice of America	9645va	9760va		
			11705va				

Start	End	Days	Station	Freq	Freq	Freq	Freq
1300	1400	w f	USA, WBCQ Monticello ME	9330na			
1300	1400		USA, WBOH Newport NC	5920am			
1300	1400		USA, WEWN Vandiver AL	9955na			
1300	1400		USA, WHRA Greenbush ME	15665na			
1300	1400		USA, WHRI Cypress Creek SC				6095am
1300	1400	Sat/Sun	USA, WHRI Cypress Creek SC				11785am
1300	1400		USA, WINB Red Lion PA	13570am			
1300	1400		USA, WRMI Miami FL	9955va			
1300	1400		USA, WTJC Newport NC	9370na			
1300	1400		USA, WWCR Nashville TN	7465na	9985na		
			13845na	15825na			
1300	1400		USA, WWRB Manchester TN 9385na				
1300	1400		Zambia, Christian Voice	5915al	6065af		
1305	1320	m	Austria, Radio Austria Intl	6155va	13730va		
			17855va				
1305	1330	Sat/Sun	Austria, Radio Austria Intl	6155me	13730va		
			17855va				
1315	1330	twhf	Austria, Radio Austria Intl	17855va			
1330	1357	a DRM	Czech Rep, Radio Prague	6065na			
1330	1400	DRM	Canada, Radio Canada Intl 7240eu				
1330	1400	twhfa	Guam, AWR/KSDA	15275as			
1330	1400		India, All India Radio	9690as	11620as		
			13710as				
1330	1400		Laos, National Radio	7145as			
1330	1400		Sweden, Radio	15240na	15735va		
1330	1400	DRM	Sweden, Radio	7275eu			
1335	1400	Sat/Sun	Austria, Radio Austria Intl	6155va	13730va		
			17855va				
1345	1400	mtwhf	Austria, Radio Austria Intl	6155va	13730va		
			17855va				
1345	1400		Guam, TWR/KTWR	9975as			

1400 UTC - 10AM EDT / 9AM CDT / 7AM PDT

Start	End	Days	Station	Freq	Freq	Freq	Freq
1400	1415	t h	Germany, Pan American BC 13645me				
1400	1427		Czech Rep, Radio Prague	11600as	13580na		
1400	1427	f DRM	Czech Rep, Radio Prague	9750na			
1400	1430		Australia, Radio 5995va	6080va	7240as		
			9590va				
1400	1430	fa	Guam, TWR/KTWR	9975as			
1400	1430		Serbia, International Radio Serbia	6100eu			
1400	1430		Thailand, Radio 9830oc				
1400	1430		UK, BBC World Service	9470eu			
1400	1500		Anguilla, University Network				11775am
1400	1500		Australia, CVC International 13635as				
1400	1500		Bhutan, BBS 6035as				
1400	1500	Sat/Sun	Canada, CBC NQ SW Service				9625na
1400	1500		Canada, CFRX Toronto ON 6070na				
1400	1500		Canada, CFVP Calgary AB 6030na				
1400	1500		Canada, CKZN St John's NF 6160na				
1400	1500		Canada, CKZU Vancouver BC				6160na
1400	1500		China, China Radio Intl	5955as	7300as		
			9460as	9700eu	9765as	9795eu	
			9870as	13675na	13685af	13740na	
			15230na	17630af			
1400	1500		Costa Rica, University Network	9725va			
			11870va	13750va			
1400	1500		France, Radio France Intl	5920as	7180as		
			9580af	15615af			
1400	1500		Germany, CVC International 15715me				
1400	1500	a	Germany, Overcomer Ministries				17810eu
1400	1500		Germany, Overcomer Ministries				6110eu
			13810va				
1400	1500	vl	Ghana, Ghana BC Corp	4915do			
1400	1500	mtw	Guam, TWR/KTWR	9975as			
1400	1500		India, All India Radio	9690as	11620as		
			13710as				
1400	1500		Japan, Radio Japan/NHK World				7200as
			9875as	11840oc			
1400	1500		Jordan, Radio	11690na			
1400	1500		Libya, Voice of Africa	17660af	17725af		
			17850af	21695af			
1400	1500		Malaysia, RTM/Trax FM	7295as			
1400	1500		Netherlands, Radio	9345as	9840as		
			11835as				
1400	1500	DRM	New Zealand, Radio NZ Intl 7145pa				
1400	1500		New Zealand, Radio NZ Intl 6095pa				
1400	1500		Nigeria, Radio/Kaduna	4770do	6090al		
1400	1500		Nigeria, Voice of/ Ext. Svc Lagos	7255af			
1400	1500		Oman, Radio Oman	15140as			
1400	1500	vl	Papua New Guinea, Wantok R. Light	7120va			
1400	1500		Singapore, MediaCorp Radio				6150do
1400	1500	vl	South Africa, Channel Africa 9620af				
1400	1500		Taiwan, Radio Taiwan Intl	15265as			
1400	1500	DRM	UK, BBC World Service	7320eu			
1400	1500		UK, BBC World Service	5975as	6190af		
			6195as	9410eu	9740eu	11760as	
			11895as	11920as	11940as	12095af	
			15485eu	17830eu	17885af	21470af	
1400	1500	DRM	UK, BBC World Service	7320eu			
1400	1500	Sat/Sun	UK, Bible Voice 11695as				

Start	End	Days/Mode	Station				
1400	1500		USA, American Forces Radio	4319usb			
				5446usb	5765usb	6350usb	7811usb
				10320usb	12133usb		
1400	1500		USA, Family Radio Worldwide FL	7580as			
				11560as	11565na	11855na	13695na
				17760na			
1400	1500		USA, KAIJ Dallas TX	9480na			
1400	1500		USA, KJES Vado NM	11715na			
1400	1500		USA, KNLS Anchor Point AK	7355as			
1400	1500		USA, KTBN Salt Lake City UT	7505na	15590na		
1400	1500		USA, KWHR Naalehu HI	9930as			
1400	1500		USA, Voice of America	4930af	6080af		
				7125va	9695va	11655va	11885va
				12150va	15205va	15580af	17895af
1400	1500		USA, WBCQ Monticello ME	9330na			
1400	1500		USA, WBOH Newport NC	5920am			
1400	1500		USA, WEWN Vandiver AL	9955na			
1400	1500		USA, WHRA Greenbush ME	15665na			
1400	1500		USA, WHRI Cypress Creek SC	6095am			
				9840am			
1400	1500	Sat/Sun	USA, WHRI Cypress Creek SC	11795am			
1400	1500		USA, WINB Red Lion PA	13570am			
1400	1500		USA, WRMI Miami FL	7385na			
1400	1500		USA, WTJC Newport NC	9370na			
1400	1500		USA, WWCR Nashville TN	7465na	9985na		
				13845na	15825na		
1400	1500		USA, WWRB Manchester TN	9385na			
1400	1500		Zambia, Christian Voice	5915al	6065af		
1415	1430		Nepal, Radio	3230as	5005as	6100as	
				7165as			
1430	1445	s	Germany, Pan American BC	13645as	13820as		
1430	1500		Australia, Radio	5995va	6080va	7240as	
				9475as	9590va	11660pa	
1430	1500		Myanmar, Radio	5986as			
1430	1500	DRM	South Korea, KBS World Radio	9770eu			
1430	1500		UK, BBC World Service	7465eu			

1500 UTC - 11AM EDT / 10AM CDT / 8AM PDT

Start	End	Days/Mode	Station				
1500	1510	mtwhfa	Turkmenistan, Turkmen Radio	5015eu			
1500	1527		Czech Rep, Radio Prague	7385na			
1500	1528		Vietnam, Voice of	9550va	9840va	12020va	
				13860va			
1500	1530	vl	Eritrea, Bana Radio	5100do			
1500	1530		Guam, AWR/KSDA	11640as			
1500	1530	Sun	Hungary, Radio Budapest	6025eu	9610eu		
1500	1530		Nigeria, Radio, Natl Svc/Abuja	7275do			
1500	1530		UK, BBC World Service	11860af	15420af		
				17885af			
1500	1530		USA, Voice of America	7175va	9760va		
				15460va			
1500	1545		Sweden, IBRA Radio	7340as			
1500	1557		Canada, Radio Canada Intl	11675as	17720as		
1500	1559		Germany, Overcomer Ministries	17815na			
1500	1600		Anguilla, University Network	11775am			
1500	1600		Australia, CVC International	13635as			
1500	1600		Australia, Radio	5995va	6080va	7240as	
				9475as	9590va		
1500	1600	Sat/Sun	Canada, CBC NQ SW Service	9625na			
1500	1600		Canada, CFRX Toronto ON	6070na			
1500	1600		Canada, CFVP Calgary AB	6030na			
1500	1600		Canada, CKZN St John's NF	6160na			
1500	1600		Canada, CKZU Vancouver BC	6160na			
1500	1600		China, China Radio Intl	5955as	7160as		
				7325as	9435eu	9525eu	9785as
				9870as	13685as	13740as	13630af
1500	1600	DRM	China, China Radio Intl	9750eu			
1500	1600		Costa Rica, University Network	9725va			
				11800va	13750va		
1500	1600		Germany, CVC International	11830af			
1500	1600	vl	Ghana, Ghana BC Corp	4915do			
1500	1600	s	Italy, IRRS	9310eu			
1500	1600		Japan, Radio Japan/NHK World	6190as			
				7200as	9505as	9875as	
1500	1600		Jordan, Radio	11690na			
1500	1600		Libya, Voice of Africa	17660af	17725af		
				17850af	21695af		
1500	1600		Malaysia, RTM/Trax FM	7295as			
1500	1600		Netherlands, Radio	9345as	9890as		
				11835as			
1500	1600	DRM	New Zealand, Radio NZ Intl	7145pa			
1500	1600		New Zealand, Radio NZ Intl	6095pa			
1500	1600		Nigeria, Radio/Kaduna	4770do	6090al		
1500	1600		North Korea, Voice of Korea	7570eu	9335na		
				11710na	12015eu		
1500	1600	vl	Papua New Guinea, Wantok R. Light	7120va			
1500	1600	DRM	Romania, Radio Romania Intl	7340eu			
1500	1600		Russia, Voice of	7260as	7350as	9660as	
1500	1600		Singapore, MediaCorp Radio	6150do			
1500	1600	vl	South Africa, Channel Africa	9620af			
1500	1600		South Africa, Channel Africa	17770af			
1500	1600		UAE, AWR Africa	11670as			
1500	1600	DRM	UK, BBC World Service	5870eu			
1500	1600		UK, BBC World Service	5875eu	5965as		
				5975as	6190af	6195as	7465eu
				9410eu	9740as	9810as	11820eu
				11920as	11940af	12095eu	15105af
				15400af	17830af	21470af	
1500	1600	f DRM	UK, China BS VT Digital	9710eu			
1500	1600	vl/ mtwhf	UK, Sudan Radio Service	15575af			
1500	1600		USA, American Forces Radio	4319usb			
				5446usb	5765usb	6350usb	7811usb
				10320usb	12133usb	13362usb	
1500	1600		USA, Family Radio Worldwide FL	6085as			
				11855na	12010as	15210na	
1500	1600		USA, KAIJ Dallas TX	9480na			
1500	1600		USA, KJES Vado NM	11715na			
1500	1600		USA, KTBN Salt Lake City UT	7505na	15590na		
1500	1600		USA, KWHR Naalehu HI	9930as			
1500	1600		USA, Voice of America	4930af	6080af		
				7125va	9645va	11890va	12150va
				13735va	15205va	15580af	17895af
1500	1600		USA, WBCQ Monticello ME	9330na			
1500	1600		USA, WBOH Newport NC	5920am			
1500	1600		USA, WEWN Vandiver AL	9450na			
1500	1600		USA, WHRA Greenbush ME	15665na			
1500	1600		USA, WHRI Cypress Creek SC	9840am			
				11795am	13760am		
1500	1600		USA, WINB Red Lion PA	13570am			
1500	1600		USA, WRMI Miami FL	7385na			
1500	1600		USA, WTJC Newport NC	9370na			
1500	1600		USA, WWCR Nashville TN	9985na	12160na		
				13845na	15825na		
1500	1600	s	USA, WWRB Manchester TN	11920va			
1500	1600		USA, WWRB Manchester TN	9385na			
1500	1600		Zambia, Christian Voice	4965af			
1505	1600	DRM	Canada, Radio Canada Intl	9800na			
1505	1600		Canada, Radio Canada Intl	9515na			
1515	1530		Vatican City, Vatican Radio	11850va	13765va		
1530	1545		India, All India Radio	9425as			
1530	1600		Bangladesh, Bangla Betar	4750as			
1530	1600		Germany, AWR Europe	15225as			
1530	1600		Iran, Voice of the Islamic Rep	6255as			
				7330as			
1530	1600	mha	UK, Bible Voice	12035as			
1530	1600		USA, Voice of America	6110va	7175va		
				9760va	15460va		
1530	1600		Vatican City, Vatican Radio	9310va	11850va		
				13795va			
1545	1600	s	Germany, Pan American BC	13820me			

1600 UTC - 12PM EDT / 11AM CDT / 9AM PDT

Start	End	Days/Mode	Station				
1600	1615		Pakistan, Radio	6215va	7530va	11570va	
1600	1620	mtwh	Moldova, Radio DMR Pridnestrovye	6235eu			
1600	1627		Iran, Voice of the Islamic Rep	6160as			
				7330as			
1600	1628		Vietnam, Voice of	7280va	9550va	9730va	
				11630va	13860va		
1600	1630	vl	Eritrea, Bana Radio	5100do			
1600	1630	h	Germany, Pan American BC	13820me			
1600	1630		Guam, AWR/KSDA	11640as	11805as		
1600	1630		Myanmar, Radio	9730do			
1600	1630	Sat/Sun	Swaziland, TWR	6070af			
1600	1630		USA, Voice of America	11890va	15205va		
1600	1640	f	Moldova, Radio DMR Pridnestrovye	6235eu			
1600	1658		Germany, Deutsche Welle	6170as	9485as		
				15640as			
1600	1700		Anguilla, University Network	11775am			
1600	1700		Australia, CVC International	13635as			
1600	1700		Australia, Radio	5995va	6080va	7240as	
				9475as	9710va	11660pa	
1600	1700	Sat	Canada, CBC NQ SW Service	9625na			
1600	1700		Canada, CFRX Toronto ON	6070na			
1600	1700		Canada, CFVP Calgary AB	6030na			
1600	1700		Canada, CKZN St John's NF	6160na			
1600	1700		Canada, CKZU Vancouver BC	6160na			
1600	1700		Canada, Radio Canada Intl	9515na			
1600	1700	DRM	Canada, Radio Canada Intl	9800na			
1600	1700		China, China Radio Intl	7150af	7255eu		
				9435eu	9525eu	9570af	
1600	1700		Costa Rica, University Network	11870va			
				13750va			
1600	1700		Egypt, Radio Cairo	11740af			
1600	1700		Ethiopia, Radio	7165af	9560af		
1600	1700		France, Radio France Intl	7170af	9730af		
				15160af			
1600	1700		Germany, CVC International	11830af			
1600	1700	s	Germany, Overcomer Ministries	17815na			
1600	1700	vl	Ghana, Ghana BC Corp	4915do			
1600	1700		Jordan, Radio	11690na			
1600	1700		Malaysia, RTM/Trax FM	7295as			

Start	End	Days	Station	Freq	Freq	Freq	Freq
1600	1700	DRM	New Zealand, Radio NZ Intl	7145pa			
1600	1700		New Zealand, Radio NZ Intl	6095pa			
1600	1700		Nigeria, Radio/Kaduna	4770do	6090al		
1600	1700		North Korea, Voice of Korea	9990va	11545af		
1600	1700	vl	Papua New Guinea, Wantok R. Light	7120va			
1600	1700		Russia, Voice of	4965as	4975as	6130eu	
				7260eu	7305as	7320eu	
1600	1700	vl	Rwanda, Radio	6055do			
1600	1700		Saudi Arabia, BSKSA	17660as			
1600	1700		Taiwan, Radio Taiwan Intl	11550as	15515as		
1600	1700		UK, BBC World Service	3255af	3915af		
				5875eu	5975as	6190af	6195as
				7465eu	9410eu	9740as	11665eu
				11820eu	11920as	12095eu	15105af
				15400af	21470af		
1600	1700	DRM	UK, BBC World Service	1296eu	5875eu		
1600	1700	vl/ mtwhf	UK, Sudan Radio Service	15575af			
1600	1700		USA, American Forces Radio				4319usb
				5446usb	5765usb	6350usb	7811usb
				10320usb	12133usb	13362usb	
1600	1700		USA, Family Radio Worldwide FL	6085am			
				11565na	11830na	12010as	13695na
				17690af	17760na	18980va	21455va
1600	1700		USA, KAIJ Dallas TX	9480na			
1600	1700		USA, KJES Vado NM	11715na			
1600	1700		USA, KTBN Salt Lake City UT	15590na			
1600	1700		USA, KWHR Naalehu HI	9930as			
1600	1700		USA, Voice of America	4930af	6080af		
				13600va	13795af	15445va	15580af
				17640va	17715af	17805af	17895af
1600	1700		USA, WBCQ Monticello ME	9330na			
1600	1700		USA, WBOH Newport NC	5920am			
1600	1700		USA, WEWN Vandiver AL	9450va	15785va		
1600	1700		USA, WHRA Greenbush ME	17650na			
1600	1700		USA, WHRI Cypress Creek SC		9840am		
				15285am			
1600	1700		USA, WINB Red Lion PA	13570am			
1600	1700	smtwhf	USA, WMLK Bethel PA	9265eu			
1600	1700		USA, WRMI Miami FL	9955va			
1600	1700		USA, WTJC Newport NC	9370na			
1600	1700		USA, WWCR Nashville TN	9985na	12160na		
				13845na	15825na		
1600	1700		USA, WWRB Manchester TN	9385na	11920va		
				15250af			
1600	1700		Zambia, Christian Voice	4965af			
1605	1620	m	Austria, Radio Austria Intl	13675na			
1605	1630	Sat/Sun	Austria, Radio Austria Intl	13675na			
1615	1630	twhf	Austria, Radio Austria Intl	13675ca			
1615	1700	Sat/Sun	UK, BBC World Service	11860af	15420af		
				17885af			
1630	1700		Guam, AWR/KSDA	6155as			
1630	1700		Slovakia, Radio Slovakia Int	5920eu	6055eu		
1630	1700		Swaziland, TWR	6070af			
1630	1700	Sat/Sun	Swaziland, TWR	6130af			
1630	1700	mtwhf	UK, BBC World Service	15420af			
1630	1700	s	UK, Bible Voice	9460me			
1635	1700	Sat/Sun	Austria, Radio Austria Intl	134675na			
1640	1650	mtwhfa	Turkmenistan, Turkmen Radio		4930eu		
1640	1700	mtwhf	UK, Bible Voice	9460me			
1645	1700	m	Austria, Radio Austria Intl	13675na			
1645	1700	twhf	Austria, Radio Austria Intl	13675na			
1645	1700	mtwhf	Swaziland, TWR	6130af			
1645	1700	f	Sweden, IBRA Radio	7250as			
1645	1700		Tajikistan, Tajik Radio	7245as			
1645	1700	a	UK, Bible Voice	9460me			

1700 UTC - 1PM EDT / 12PM CDT / 10AM PDT

Start	End	Days	Station	Freq	Freq	Freq
1700	1704		Canada, Radio Canada Intl	9515na		
1700	1704	DRM	Canada, Radio Canada Intl	9800na		
1700	1715	mtwhf	Swaziland, TWR	6130af		
1700	1715	mtwhf	UK, Bible Voice	9460me		
1700	1720	mtwh	Moldova, Radio DMR Pridnestrovye	6235eu		
1700	1727		Czech Rep, Radio Prague	5930eu	15710af	
1700	1730		France, Radio France Intl	11615af		
1700	1730		Jordan, Radio	11690na		
1700	1730		UK, BBC World Service	9435af		
1700	1730	mtwhf	UK, United Nations Radio	7170va	9565va	
				17810va		
1700	1740	f	Moldova, Radio DMR Pridnestrovye	6235eu		
1700	1745		UK, BBC World Service	6005af	9630af	
1700	1750	DRM	New Zealand, Radio NZ Intl	7145pa		
1700	1800		Anguilla, University Network	11775am		
1700	1800		Australia, CVC International	13635af		
1700	1800		Australia, Radio	5995va	6080va	7240as
				9475as	9580va	9710va	11660pa
				11880pa		
1700	1800	Sat	Canada, CBC NQ SW Service	9625na		
1700	1800		Canada, CFRX Toronto ON	6070na		
1700	1800		Canada, CFVP Calgary AB	6030na		
1700	1800		Canada, CKZN St John's NF	6160na		

Start	End	Days	Station	Freq	Freq	Freq	Freq
1700	1800		Canada, CKZU Vancouver BC	6160na			
1700	1800		China, China Radio Intl	7150af	7205eu		
				7255eu	9570af		
1700	1800		Costa Rica, University Network		11870va		
				13750va			
1700	1800		Egypt, Radio Cairo	11740af			
1700	1800		Eqt. Guinea, Radio Africa	15190af			
1700	1800		Germany, CVC International	15680af			
1700	1800	s	Germany, Universal Life	5775va			
1700	1800	vl	Ghana, Ghana BC Corp	4915do			
1700	1800	fs	Italy, IRRS	9310va			
1700	1800		Japan, Radio Japan/NHK World		9535va		
				11970eu	15355af		
1700	1800	DRM	Japan, Radio Japan/NHK World		9770eu		
1700	1800		Malaysia, RTM/Trax FM	7295as			
1700	1800		New Zealand, Radio NZ Intl	6095pa			
1700	1800		Nigeria, Radio/Kaduna	4770do	6090al		
1700	1800		Nigeria, Voice of/ Ext. Svc Lagos	15120va			
1700	1800	vl	Papua New Guinea, Wantok R. Light	7120va			
1700	1800		Romania, Radio Romania Intl		9535eu		
				11735eu			
1700	1800		Russia, Voice of	6125as	7125as	7270va	
				7320eu	9470me		
1700	1800	vl	Rwanda, Radio	6055do			
1700	1800		Saudi Arabia, BSKSA	17600as			
1700	1800		South Africa, Channel Africa	15235af			
1700	1800		Swaziland, TWR	3200af			
1700	1800		Taiwan, Radio Taiwan Intl	15690af			
1700	1800	DRM	UK, BBC World Service	1296eu	5875eu		
1700	1800		UK, BBC World Service	3255af	3915as		
				5975as	6190af	6195eu	7465eu
				9410eu	9740as	11665eu	11955as
				12095af	15400af	21470af	
1700	1800	Sat/Sun	UK, Bible Voice	9460me			
1700	1800	vl/ mtwhf	UK, Sudan Radio Service	11705af			
1700	1800		USA, American Forces Radio				4319usb
				5446usb	5765usb	6350usb	7811usb
				10320usb	12133usb	13362usb	
1700	1800		USA, Family Radio Worldwide FL	13695na			
				17555na	21680na		
1700	1800		USA, KAIJ Dallas TX	9480na			
1700	1800		USA, KTBN Salt Lake City UT	15590na			
1700	1800		USA, KWHR Naalehu HI	9930as			
1700	1800		USA, Voice of America	6080af	13710af		
				15580af			
1700	1800	Sat/Sun	USA, Voice of America	4930af			
1700	1800		USA, WBCQ Monticello ME	9330na	18910na		
1700	1800		USA, WBOH Newport NC	5920am			
1700	1800		USA, WEWN Vandiver AL	9450va	15785va		
1700	1800		USA, WHRA Greenbush ME	17650na			
1700	1800		USA, WHRI Cypress Creek SC		9840am		
				15285am	15650am		
1700	1800		USA, WINB Red Lion PA	13570am			
1700	1800	smtwhf	USA, WMLK Bethel PA	9265eu			
1700	1800		USA, WRMI Miami FL	9955va			
1700	1800		USA, WTJC Newport NC	9370na			
1700	1800		USA, WWCR Nashville TN	9985na	12160na		
				13845na	15825na		
1700	1800		USA, WWRB Manchester TN	9385na	11920va		
				15250af			
1700	1800		Zambia, Christian Voice	4965af			
1715	1730		Vatican City, Vatican Radio	4005eu	7250eu		
				9635eu	9645eu		
1715	1800	t	UK, Bible Voice	9460me			
1730	1800		Bulgaria, Radio	5900eu	9600eu		
1730	1800		Guam, AWR/KSDA	9980me			
1730	1800	vl	Liberia, ELWA	4760do			
1730	1800		Philippines, Radio Pilipinas	11720va	15190va		
				17720va			
1730	1800		Swaziland, TWR	9500af			
1730	1800		Sweden, Radio	6065va			
1730	1800	s	UK, Bible Voice	9730me			
1730	1800		USA, Voice of America	4930af	11815af		
1730	1800	mtwhf	USA, Voice of America	15775af			
1730	1800		Vatican City, Vatican Radio	9755af	11625af		
				13795af			
1745	1800		India, All India Radio	7410eu	9445af		
				9950eu	11620eu	11935af	13605af
				15075af	15155af	17670af	
1751	1800	DRM	New Zealand, Radio NZ Intl	9440pa			

1800 UTC - 2PM EDT / 1PM CDT / 11AM PDT

Start	End	Days	Station	Freq	Freq	Freq
1800	1815	t	UK, Bible Voice	9460me		
1800	1815	a	UK, Bible Voice	7210me		
1800	1827		Czech Rep, Radio Prague	5930eu	9400va	
1800	1828		Vietnam, Voice of	5955eu	7280va	9730va
1800	1830	w	Austria, AWR Europe	15315af		
1800	1830		Nigeria, Radio, Natl Svc/Abuja	7275do		
1800	1830		South Africa, AWR Africa	3215af	3345af	
				11830af		

Start	Stop	Days	Station				
1800	1830		UK, BBC World Service	9740as			
1800	1830	Sat/Sun	USA, Voice of America	4930af			
1800	1830		USA, Voice of America	6080af	11975af		
				13710af	15580af	17895af	
1800	1850		New Zealand, Radio NZ Intl	6095pa			
1800	1850	DRM	New Zealand, Radio NZ Intl	9440pa			
1800	1859		Canada, Radio Canada Intl	9530af	11765af		
				13730af	15235af		
1800	1859		Poland, Radio Polonia	6015eu	7130eu		
1800	1900		Anguilla, University Network	11775am			
1800	1900	mtwhf	Argentina, RAE	9690eu	15345eu		
1800	1900		Australia, Radio	6080va	7240as	9475as	
				9500as	9580va	9710va	11880pa
1800	1900		Canada, CFRX Toronto ON	6070na			
1800	1900		Canada, CFVP Calgary AB	6030na			
1800	1900		Canada, CKZN St John's NF	6160na			
1800	1900		Canada, CKZU Vancouver BC		6160na		
1800	1900		China, China Radio Intl	6100eu	7100eu		
1800	1900		Costa Rica, University Network		11870va		
			13750va				
1800	1900		Egypt, Radio Cairo	11740af			
1800	1900		Eqt. Guinea, Radio Africa	15190af			
1800	1900		Germany, CVC International	9490af			
1800	1900		Germany, Universal Life	5775va			
1800	1900	vl	Ghana, Ghana BC Corp	4915do			
1800	1900		India, All India Radio	7410eu	9445af		
				9950eu	11620eu	11935af	13605af
				15075af	15155af	17670af	
1800	1900	fs	Italy, IRRS	9310va			
1800	1900	vl	Liberia, ELWA	4760do			
1800	1900		Malaysia, RTM/Trax FM	7295as			
1800	1900		Netherlands, Radio	6020af	7125af		
				11655af			
1800	1900		Nigeria, Radio/Kaduna	4770do	6090al		
1800	1900		Nigeria, Voice of/ Ext. Svc Lagos		15120va		
1800	1900		North Korea, Voice of Korea	7570eu	12015eu		
1800	1900	vl	Papua New Guinea, Wantok R. Light	7120va			
1800	1900		Philippines, Radio Pilipinas	11720va	15190va		
				17720va			
1800	1900		Russia, Voice of	6125as	7105eu	7125as	
				7270va	7295as	7320eu	11510af
1800	1900	Sat/Sun	Russia, Voice of	6055eu	6175eu		
1800	1900	vl	Rwanda, Radio	6055do			
1800	1900		Saudi Arabia, BSKSA	17600as			
1800	1900		Swaziland, TWR	3200af	9500af		
1800	1900		Taiwan, Radio Taiwan Intl	3965eu			
1800	1900	DRM	UK, BBC World Service	1296eu	5970eu		
1800	1900		UK, BBC World Service	3255af	5875eu		
				5955as	6190af	6195af	7465eu
				9410eu	11955as	12095af	15400af
				17830af	21470af		
1800	1900	a	UK, Bible Voice	9730me			
1800	1900		USA, American Forces Radio		4319usb		
				5446usb	5765usb	6350usb	7811usb
				10320usb	12133usb	13362usb	
1800	1900		USA, Family Radio Worldwide FL		7240va		
				7345va	13695na	17535na	17555na
				18980va			
1800	1900		USA, KAIJ Dallas TX	9480na			
1800	1900		USA, KTBN Salt Lake City UT	15590na			
1800	1900	smtwhf	USA, WBCQ Monticello ME	7415na			
1800	1900		USA, WBCQ Monticello ME	9330na	18910na		
1800	1900		USA, WBOH Newport NC	5920am			
1800	1900		USA, WEWN Vandiver AL	9450va	15785va		
1800	1900		USA, WHRA Greenbush ME	17650na			
1800	1900		USA, WHRI Cypress Creek SC		9840am		
				15285am	15650am		
1800	1900		USA, WINB Red Lion PA	13570am			
1800	1900	smtwhf	USA, WMLK Bethel PA	9265eu			
1800	1900		USA, WRMI Miami FL	9955va			
1800	1900		USA, WTJC Newport NC	9370na			
1800	1900		USA, WWCR Nashville TN	9985na	12160na		
				13845na	15825na		
1800	1900		USA, WWRB Manchester TN	9385na	11920va		
				15250af			
1800	1900		Yemen, Rep of Yemen Radio	9780me			
1800	1900		Zambia, Christian Voice	4965af			
1815	1900		Bangladesh, Bangla Betar	7185eu			
1830	1845		Israel, Kol Israel	6985va	7545va	9345eu	
1830	1845		Sweden, IBRA Radio	9529af			
1830	1900		Slovakia, Radio Slovakia Int	5920eu	7345eu		
1830	1900		Turkey, Voice of	9785eu			
1830	1900		UK, BBC World Service	6005af	9630af		
1830	1900	s	UK, Bible Voice	9730me			
1830	1900	h	UK, Bible Voice	9460me			
1830	1900		USA, Voice of America	4930af	6080af		
				11975af	13710af	15580af	17895af
1845	1900	mtwhfa	Albania, Radio Tirana	6035eu	7465eu		
1845	1900		Congo, RTV Congolaise	4765af	5985af		
1845	1900	a	UK, Bible Voice	7210me			
1851	1900	DRM	New Zealand, Radio NZ Intl	11675pa			

1900 UTC - 3PM EDT / 2PM CDT / 12PM PDT

Start	Stop	Days	Station				
1900	1903		Bahrain, Radio Bahrain	6010as			
1900	1915		Congo, RTV Congolaise	4765af	5985af		
1900	1925		Turkey, Voice of	9785eu			
1900	1928		Vietnam, Voice of	7280va	9730va		
1900	1930		Germany, Deutsche Welle	9895af	15620af		
				17820af			
1900	1930	s	Germany, Universal Life	5775me			
1900	1930		Hungary, Radio Budapest	3975eu	6025eu		
1900	1930		Philippines, Radio Pilipinas	11720va	15190va		
				17720va			
1900	1930	s	UK, Bible Voice	6015eu			
1900	1930	a	UK, Bible Voice	7260af	9460me		
1900	1945		India, All India Radio	7410eu	9445af		
				9950eu	11620eu	11935af	13605af
				15075af	15155af	17670af	
1900	1950		New Zealand, Radio NZ Intl	11725pa			
1900	1957	Sat/Sun	Netherlands, Radio	15315na	17660va		
				17735af			
1900	2000		Anguilla, University Network		11775am		
1900	2000		Australia, Radio	6080va	7240as	9500as	
				9580va	9710va	11880pa	
1900	2000		Canada, CFRX Toronto ON	6070na			
1900	2000		Canada, CFVP Calgary AB	6030na			
1900	2000		Canada, CKZN St John's NF	6160na			
1900	2000		Canada, CKZU Vancouver BC		6160na		
1900	2000		China, China Radio Intl	7295va	9440va		
1900	2000		Costa Rica, University Network		11870va		
				13750va			
1900	2000		Eqt Guinea, Radio Africa	15190af			
1900	2000		Germany, CVC International	9490af			
1900	2000	vl	Ghana, Ghana BC Corp	4915do			
1900	2000		Italy, IRRS	9310va			
1900	2000	vl	Liberia, ELWA	4760do			
1900	2000		Malaysia, RTM/Trax FM	7295as			
1900	2000		Netherlands, Radio	5905af	7115af		
				11655af	17810af		
1900	2000	DRM	New Zealand, Radio NZ Intl	11675pa			
1900	2000		Nigeria, Radio/Kaduna	4770do	6090al		
1900	2000		Nigeria, Voice of/ Ext. Svc Lagos		15120va		
1900	2000		North Korea, Voice of Korea	7100af	9975va		
				11535va			
1900	2000		Papua New Guinea, Catholic Radio	4960do			
1900	2000		Papua New Guinea, NBC	4890do			
1900	2000	vl	Papua New Guinea, Wantok R. Light	7120va			
1900	2000		Russia, Voice of	6175eu	7105eu	7290eu	
				7335af	11510af		
1900	2000	vl	Rwanda, Radio	6055do			
1900	2000	vl	Solomon Islands, SIBC	5020do	9545do		
1900	2000	vl	South Africa, Channel Africa	3345af			
1900	2000		South Korea, KBS World Radio		7275eu		
1900	2000		Swaziland, TWR	3200af			
1900	2000		Thailand, Radio	7155eu			
1900	2000	vl	Uganda, Radio	4976do	5026do		
1900	2000	DRM	UK, BBC World Service	1296eu			
1900	2000		UK, BBC World Service	3255af	5875eu		
				5955as	6005af	6190af	6195eu
				9410eu	9630af	11955as	12095af
				15400af	17830af		
1900	2000	Sat/Sun	UK, Bible Voice	9470me			
1900	2000		USA, American Forces Radio		4319usb		
				5446usb	5765usb	6350usb	7811usb
				10320usb	12133usb	13362usb	
1900	2000		USA, Family Radio Worldwide FL		3230af		
				6020af	6085am	7160va	7395af
				13695na	15115af	15565va	17535na
				17555na	18980va		
1900	2000		USA, KAIJ Dallas TX	9480na			
1900	2000		USA, KJES Vado NM	15385na			
1900	2000		USA, KTBN Salt Lake City UT	15590na			
1900	2000		USA, Voice of America	4930af	4940af		
				6080af	11975af	13710af	15580af
1900	2000		USA, WBCQ Monticello ME	7415na	9330na		
				18910na			
1900	2000		USA, WBOH Newport NC	5920am			
1900	2000		USA, WEWN Vandiver AL	9450va	15785va		
1900	2000		USA, WHRA Greenbush ME	17650na			
1900	2000		USA, WHRI Cypress Creek SC		9840am		
				13760am	15285am		
1900	2000		USA, WINB Red Lion PA	13570am			
1900	2000	smtwhf	USA, WMLK Bethel PA	9265eu			
1900	2000		USA, WRMI Miami FL	9955va			
1900	2000		USA, WTJC Newport NC	9370na			
1900	2000		USA, WWCR Nashville TN	9975na	12160na		
				13845na	15825na		
1900	2000		USA, WWRB Manchester TN	9385na	11920va		
				15250af			
1900	2000		Zambia, Christian Voice	4965af			
1915	2000	f	UK, Bible Voice	9470me			
1930	1958		Serbia, International Radio Serbia		6100eu		
1930	2000	Sat/Sun	Germany, Pan American BC	5850me			

Start	End	Days	Station	Freq1	Freq2	Freq3	Freq4
1930	2000		Iran, Voice of the Islamic Rep	6010eu			
			6255va	7320af	9855af	11695af	
1930	2000		Lithuania, Radio Vilnius	6250eu			
1930	2000		Sweden, Radio	6065va			
1930	2000	s	UK, Bible Voice	7260af			
1935	1955		Italy, RAI Italia	5960eu	9845eu		
1945	2000	a	UK, Bible Voice	6015va			
1945	2000		Vatican City, Vatican Radio	9800am			
1951	2000		New Zealand, Radio NZ Intl	15720pa			

2000 UTC - 4PM EDT / 3PM CDT / 1PM PDT

Start	End	Days	Station	Freq1	Freq2	Freq3	Freq4
2000	2015	s	Germany, Pan American BC	5850me			
2000	2015	a	UK, Bible Voice	6015va			
2000	2025		Israel, Kol Israel	6280va	7545va	9345va	
2000	2027		Iran, Voice of the Islamic Rep	6010eu			
			6255va	7320af	9855af	11695af	
2000	2030	mtwhfa	Albania, Radio Tirana	7465eu			
2000	2030		Egypt, Radio Cairo	15375af			
2000	2030		Germany, AWR Europe	15235as			
2000	2030	f	Germany, Pan American BC	5850me			
2000	2030		Lithuania, Radio Vilnius	6250eu			
2000	2030		South Africa, AWR Africa	9655af			
2000	2030		Swaziland, TWR	3200af			
2000	2030	s	UK, Bible Voice	6015va			
2000	2030		Vatican City, Vatican Radio	7365af	9755af		
			11625af				
2000	2050	DRM	New Zealand, Radio NZ Intl	11675pa			
2000	2057		Germany, Deutsche Welle	7130af	11795af		
2000	2059		Canada, Radio Canada Intl	5850eu	7235eu		
			15325eu				
2000	2100		Anguilla, University Network	11775am			
2000	2100		Australia, ABC NT Alice Springs	2310do			
			4835do				
2000	2100		Australia, ABC NT Katherine	2485do			
2000	2100		Australia, ABC NT Tennant Creek	2325do			
2000	2100		Australia, Radio	6080va	7240as	9500as	
			11650pa	11660pa	11880pa		
2000	2100		Canada, CFRX Toronto ON	6070na			
2000	2100		Canada, CFVP Calgary AB	6030na			
2000	2100		Canada, CKZN St John's NF	6160na			
2000	2100		Canada, CKZU Vancouver BC		6160na		
2000	2100		China, China Radio Intl	5960eu	7170eu		
			7190eu	7285eu	7295va	7295va	
			9440va	9600eu	11640af	13630af	
2000	2100		Costa Rica, University Network	13750va			
2000	2100		Eqt Guinea, Radio Africa	15190af			
2000	2100		Germany, CVC International	7285af			
2000	2100		Germany, Deutsche Welle	11865af	15205af		
2000	2100	vl	Ghana, Ghana BC Corp	4915do			
2000	2100		Indonesia, Voice of	9525eu	11785eu		
			15150al				
2000	2100		Italy, IRRS	5775eu			
2000	2100	vl	Liberia, ELWA	4760do			
2000	2100		Malaysia, RTM/Trax FM	7295as			
2000	2100		Netherlands, Radio	5905af	7115af		
			17810af				
2000	2100	Sat/Sun	Netherlands, Radio	15315na	17660va		
			17735na				
2000	2100		Nigeria, Radio/Kaduna	4770do	6090al		
2000	2100		Nigeria, Voice of/ Ext. Svc Lagos	15120va			
2000	2100		Papua New Guinea, Catholic Radio	4960do			
2000	2100		Papua New Guinea, NBC	4890do			
2000	2100	vl	Papua New Guinea, Wantok R. Light	7120va			
2000	2100		Russia, Voice of	5955as	6145eu	7105eu	
			7290eu	7330va			
2000	2100	vl	Rwanda, Radio	6055do			
2000	2100	vl	Solomon Islands, SIBC	5020do	9545do		
2000	2100	vl	South Africa, Channel Africa	3345af			
2000	2100	mtwhf	Spain, Radio Exterior Espana	9665eu	11625af		
2000	2100	vl	Uganda, Radio	4976do	5026do		
2000	2100	DRM	UK, BBC World Service	1296eu			
2000	2100		UK, BBC World Service	3255eu	5875eu		
			6005af	6190af	6195eu	9630af	
			12095af	15400af	17830af		
2000	2100		USA, American Forces Radio				4319usb
			5446usb	5765usb	6350usb	7811usb	
			10320usb	12133usb	13362usb		
2000	2100		USA, Family Radio Worldwide FL				3230af
			5745va	5810va	6855va	7300va	
			7580va	15115af	15195af		
2000	2100		USA, KAIJ Dallas TX	9480na			
2000	2100		USA, KJES Vado NM	15385na			
2000	2100		USA, KTBN Salt Lake City UT	15590na			
2000	2100		USA, WBCQ Monticello ME	7415na	9330na		
			18910na				
2000	2100		USA, WBOH Newport NC	5920am			
2000	2100		USA, WEWN Vandiver AL	9450va	15785va		
2000	2100		USA, WHRI Cypress Creek SC				11765am
			15285am				
2000	2100		USA, WINB Red Lion PA	13570am			

Start	End	Days	Station	Freq1	Freq2	Freq3	Freq4
2000	2100	smtwhf	USA, WMLK Bethel PA	9265eu			
2000	2100		USA, WRMI Miami FL	9955va			
2000	2100		USA, WTJC Newport NC	9370na			
2000	2100		USA, WWCR Nashville TN	9975na	12160na		
			13845na	15825na			
2000	2100		USA, WWRB Manchester TN	9385na	11920va		
			15250af				
2000	2100		Zambia, Christian Voice	4965af			
2005	2100		Syria, Radio Damascus	9330eu	12085eu		
2025	2045		Italy, RAI Italia	5970eu	11875va		
2030	2045		Thailand, Radio	9535eu			
2030	2058		Vietnam, Voice of	7280va	9550va	9730va	
			13860va				
2030	2100		Cuba, Radio Havana	9505va	11760va		
2030	2100		Netherlands, Radio	9800na			
2030	2100		Romania, Radio Romania Intl				9515va
			11810va	11940va	15465va		
2030	2100		Turkey, Voice of	7170va			
2030	2100		USA, Voice of America	4930af	6080af		
			7595as	11975af	13710af	15580af	
2030	2100	Sat/Sun	USA, Voice of America	4940af			
2045	2100		India, All India Radio	7410eu	9445eu		
			9910oc	9950eu	11620eu	11715oc	
2045	2100	DRM	Vatican City, Vatican Radio	9800am			
2050	2100		Vatican City, Vatican Radio	4005eu	5885eu		
			7250eu				
2051	2100	DRM	New Zealand, Radio NZ Intl	13730pa			

2100 UTC - 5PM EDT / 4PM CDT / 2PM PDT

Start	End	Days	Station	Freq1	Freq2	Freq3	Freq4
2100	2120		Vatican City, Vatican Radio	4005eu	5885eu		
			7250eu				
2100	2125		Turkey, Voice of	7170va			
2100	2127		Czech Rep, Radio Prague	5930va	9430va		
2100	2130		Australia, ABC NT Katherine	2485do			
2100	2130		Australia, ABC NT Tennant Creek	2325do			
2100	2130		Austria, AWR Europe	11955af			
2100	2130	Sat	Canada, CBC NQ SW Service	9625na			
2100	2130		China, China Radio Intl	11640va	13630va		
2100	2130		Cuba, Radio Havana	9505va	11760va		
2100	2130		Hungary, Radio Budapest	6025eu	9525af		
2100	2130		Italy, IRRS	5775eu			
2100	2130		Nigeria, Radio, Natl Svc/Abuja				7275do
2100	2130		USA, Voice of America	7595as			
2100	2130	DRM	Vatican City, Vatican Radio	9800na			
2100	2157		Germany, Deutsche Welle	15205af			
2100	2159	smtwhf	Germany, Overcomer Ministries				7310eu
2100	2159	Sat/Sun	Spain, Radio Exterior Espana	9840eu	11625af		
2100	2200		Anguilla, University Network				11775am
2100	2200		Australia, ABC NT Alice Springs	2310do			
			4835do				
2100	2200		Australia, Radio	9500as	9660as	11650pa	
			11695pa	12080as	13630as	15515as	
2100	2200		Belarus, Radio	7360eu	7390eu	7420eu	
2100	2200		Bulgaria, Radio	5900eu	9700eu		
2100	2200		Canada, CFRX Toronto ON	6070na			
2100	2200		Canada, CFVP Calgary AB	6030na			
2100	2200		Canada, CKZN St John's NF	6160na			
2100	2200		Canada, CKZU Vancouver BC		6160na		
2100	2200	DRM	Canada, Radio Canada Intl	9800na			
2100	2200		China, China Radio Intl	7190eu	7285eu		
			9600eu				
2100	2200		Costa Rica, University Network				13750va
2100	2200		Eqt Guinea, Radio Africa	15190af			
2100	2200		Germany, Deutsche Welle	9735af	11865af		
2100	2200	vl	Ghana, Ghana BC Corp	4915do			
2100	2200		Guyana, Voice of	3291do	5950do		
2100	2200		India, All India Radio	7410eu	9445eu		
			9910oc	9950eu	11620eu	11715oc	
2100	2200		Japan, Radio Japan/NHK World	6035eu			
			6090eu	6180eu	11855ca	17825na	
			21670pa				
2100	2200	vl	Liberia, ELWA	4760do			
2100	2200		Malaysia, RTM/Trax FM	7295as			
2100	2200		New Zealand, Radio NZ Intl	15270pa			
2100	2200	DRM	New Zealand, Radio NZ Intl	13730pa			
2100	2200		Nigeria, Radio/Kaduna	4770do	6090al		
2100	2200		North Korea, Voice of Korea	7570eu	12015eu		
2100	2200		Papua New Guinea, Catholic Radio	4960do			
2100	2200		Papua New Guinea, NBC	4890do			
2100	2200	vl	Papua New Guinea, Wantok R. Light	7120va			
2100	2200	vl	South Africa, Channel Africa	3345af			
2100	2200		Syria, Radio Damascus	9330eu	12085eu		
2100	2200	DRM	UK, BBC World Service	1296eu			
2100	2200		UK, BBC World Service	3255af	3915as		
			5875eu	5965as	6005af	6125as	
			6190af	6195va	9480eu	9650eu	
			11675am				
2100	2200		Ukraine, Radio Ukraine Intl	7510eu			
2100	2200		USA, American Forces Radio				4319usb
			5446usb	5765usb	6350usb	7811usb	

Start	Stop	Days	Station	Freq	Freq	Freq	Freq
				10320usb	12133usb	13362usb	
2100	2200		USA, Family Radio Worldwide FL	5745va			
				5810va	5955af	6855va	7300va
				7580va	15195af	15565af	
2100	2200		USA, KAIJ Dallas TX	9480na			
2100	2200		USA, KTBN Salt Lake City UT	15590na			
2100	2200		USA, Voice of America	6080af	15580af		
2100	2200		USA, WBCQ Monticello ME	7415na	9330na		
				18910na			
2100	2200		USA, WBOH Newport NC	5920am			
2100	2200		USA, WEWN Vandiver AL	6890va	15785va		
2100	2200		USA, WHRI Cypress Creek SC	9660am			
				11765am			
2100	2200		USA, WINB Red Lion PA	13570am			
2100	2200	mtwhfa	USA, WRMI Miami FL	9955va			
2100	2200	Sun	USA, WRMI Miami FL	7385na			
2100	2200		USA, WTJC Newport NC	9370na			
2100	2200		USA, WWCR Nashville TN	9975na	12160na		
				13845na	15825na		
2100	2200		USA, WWRB Manchester TN	9385na	11920va		
				15250af			
2100	2200		Zambia, Christian Voice	4965af			
2115	2200		Egypt, Radio Cairo	9990af			
2115	2200		USA, Family Radio Worldwide FL	11875af			
2130	2200		Australia, ABC NT Katherine	5025do			
2130	2200		Australia, ABC NT Tennant Creek	4910do			
2130	2200	mtwhfa	Canada, CBC NQ SW Service	9625na			
2130	2200		Guam, AWR/KSDA	11850as			
2130	2200		Sweden, Radio	6065va	7420va		
2130	2200		USA, Voice of America	7405as			

2200 UTC - 6PM EDT / 5PM CDT / 3PM PDT

Start	Stop	Days	Station	Freq	Freq	Freq	Freq
2200	2210		Syria, Radio Damascus	9330eu	12085eu		
2200	2230		India, All India Radio	7410eu	9445eu		
				11715oc	9950eu	11620eu	11715oc
2200	2230	vl	Liberia, ELWA	4760do			
2200	2230		Papua New Guinea, NBC	4890do			
2200	2230		South Korea, KBS World Radio	3955eu			
2200	2245		Egypt, Radio Cairo	9990eu			
2200	2258	DRM	New Zealand, Radio NZ Intl	13730pa			
2200	2258		New Zealand, Radio NZ Intl	15270pa			
2200	2300		Anguilla, University Network	6090am			
2200	2300		Australia, ABC NT Alice Springs	2310do			
				4835do			
2200	2300		Australia, ABC NT Katherine	5025do			
2200	2300		Australia, ABC NT Tennant Creek	4910do			
2200	2300		Australia, Radio	13620as	13630pa	15230va	
				15240pa	15515va	17785va	
2200	2300		Belarus, Radio	7360eu	7390eu	7490eu	
2200	2300	smtwhf	Canada, CBC NQ SW Service	9625na			
2200	2300		Canada, CFRX Toronto ON	6070na			
2200	2300		Canada, CFVP Calgary AB	6030na			
2200	2300		Canada, CKZN St John's NF	6160na			
2200	2300		Canada, CKZU Vancouver BC	6160na			
2200	2300		China, China Radio Intl	5915as	7170eu		
2200	2300		Costa Rica, University Network	13750va			
2200	2300		Eqt Guinea, Radio Africa	15190af			
2200	2300	vl	Ghana, Ghana BC Corp	4915do			
2200	2300		Guyana, Voice of	3291do			
2200	2300		Malaysia, RTM/Trax FM	7295as			
2200	2300		Nigeria, Radio/Kaduna	4770do	6090al		
2200	2300		Papua New Guinea, Catholic Radio	4960do			
2200	2300	vl	Papua New Guinea, Wantok R. Light	7120va			
2200	2300		Romania, Radio Romania Intl	7185va			
				9675va	9790va	11940va	
2200	2300	vl	Solomon Islands, SIBC	5020do	9545do		
2200	2300		Taiwan, Radio Taiwan Intl	15600eu			
2200	2300		Turkey, Voice of	6195va			
2200	2300	DRM	UK, BBC World Service	1296eu			
2200	2300		UK, BBC World Service	5955as	5965as		
				5975am	6195as	7105as	9480eu
				9650eu	9740af	15400af	
2200	2300		USA, American Forces Radio	4319usb			
				5446usb	5765usb	6350usb	7811usb
				10320usb	12133usb	13362usb	
2200	2300		USA, Family Radio Worldwide FL	21525af			
2200	2300		USA, KAIJ Dallas TX	9480na			
2200	2300		USA, KTBN Salt Lake City UT	15590na			
2200	2300		USA, Voice of America	7120va	7405as		
				11725va	15185va	15290va	
2200	2300	mtwhf	USA, WBCQ Monticello ME	5110na	18910na		
2200	2300		USA, WBCQ Monticello ME	7415na	9330na		
2200	2300		USA, WBOH Newport NC	5920am			
2200	2300		USA, WEWN Vandiver AL	7560va	9975va		
2200	2300		USA, WHRI Cypress Creek SC	7490am			
				9660am			
2200	2300		USA, WINB Red Lion PA	13570am			
2200	2300		USA, WRMI Miami FL	9955va			
2200	2300		USA, WTJC Newport NC	9370na			
2200	2300		USA, WWCR Nashville TN	7465na	9985na		

Start	Stop	Days	Station	Freq	Freq	Freq
				12160na	13845na	
2200	2300	as	USA, WWRB Manchester TN	3185na		
2200	2300		Zambia, Christian Voice	4965af		
2205	2230		Italy, RAI Italia	11895va		
2230	2257		Czech Rep, Radio Prague	5930na	9435af	
2230	2300		Guam, AWR/KSDA	15320as		
2230	2300		Papua New Guinea, NBC	9675do		
2230	2300		USA, Voice of America	7230va	9780va	
				13755va		
2245	2300		India, All India Radio	9705as	9950as	
				11620as	11645as	13605as
2259	2300	DRM	New Zealand, Radio NZ Intl	15720pa		

2300 UTC - 7PM EDT / 6PM CDT / 4PM PDT

Start	Stop	Days	Station	Freq	Freq	Freq
2300	0000		Anguilla, University Network	6090am		
2300	0000		Australia, ABC NT Alice Springs	2310do		
				4835do		
2300	0000		Australia, ABC NT Katherine	5025do		
2300	0000		Australia, ABC NT Tennant Creek	4910do		
2300	0000	smtwhf	Canada, CBC NQ SW Service	9625na		
2300	0000		Canada, CFRX Toronto ON	6070na		
2300	0000		Canada, CFVP Calgary AB	6030na		
2300	0000		Canada, CKZN St John's NF	6160na		
2300	0000		Canada, CKZU Vancouver BC	6160na		
2300	0000		China, China Radio Intl	5915as	5990am	
				6040na	6145as	7180as	11970na
2300	0000		Costa Rica, University Network	13750va		
2300	0000		Cuba, Radio Havana	9550va		
2300	0000		Egypt, Radio Cairo	11950eu		
2300	0000	vl	Ghana, Ghana BC Corp	4915do		
2300	0000		Guyana, Voice of	3291do		
2300	0000		India, All India Radio	9705as	9950as	
				11620as	11645as	13605as
2300	0000		Malaysia, RTM/Trax FM	7295as		
2300	0000		New Zealand, Radio NZ Intl	13730pa		
2300	0000	DRM	New Zealand, Radio NZ Intl	15720pa		
2300	0000		Papua New Guinea, Catholic Radio	4960do		
2300	0000		Papua New Guinea, NBC	9675do		
2300	0000	vl	Papua New Guinea, Wantok R. Light	7120va		
2300	0000		Singapore, MediaCorp Radio	6150do		
2300	0000	vl	Solomon Islands, SIBC	5020do	9545do	
2300	0000		UK, BBC World Service	3915as	5965as	
				5985as	6170as	9480eu	11945as
				11955as		
2300	0000		USA, American Forces Radio	4319usb		
				5446usb	5765usb	6350usb	7811usb
				10320usb	12133usb	13362usb	
2300	0000		USA, KAIJ Dallas TX	9480na		
2300	0000		USA, KTBN Salt Lake City UT	15590na		
2300	0000		USA, Voice of America	7120va	7405na	
				11725va	15185va	15290va	
2300	0000		USA, WBCQ Monticello ME	5110na	7415na	
				9330na	18910na	
2300	0000		USA, WBOH Newport NC	5920am		
2300	0000		USA, WEWN Vandiver AL	7560va	9975va	
2300	0000		USA, WHRA Greenbush ME	5850na		
2300	0000		USA, WHRI Cypress Creek SC	7315am		
				7490am		
2300	0000		USA, WINB Red Lion PA	9265am		
2300	0000		USA, WRMI Miami FL	9955va		
2300	0000		USA, WTJC Newport NC	9370na		
2300	0000		USA, WWCR Nashville TN	5070na	7465na	
				9985na	13845na	
2300	0000	smtwhf	USA, WWRB Manchester TN	5745ca		
2300	0000		Zambia, Christian Voice	4965af		
2300	2300		Bulgaria, Radio	9700na	11700na	
2300	2315		Nigeria, Radio/Kaduna	4770do	6090al	
2300	2315		USA, Family Radio Worldwide FL	11875af		
				15170am	15400am	17555am	17575am
2300	2330		Australia, Radio	9660as	12080as	13630pa
				13670pa	15230pa	15240va	17785va
				17795va		
2300	2330		USA, Voice of America	6180va	7205va	
				15150va		
2305	0000		Canada, Radio Canada Intl	6100na		
2315	2330		Croatia, Croatian Radio	7285sa		
2330	0000		Australia, Radio	9660as	12080as	13620pa
				13670pa	15230pa	15415va	17750va
				17785va	17795va	
2330	0000		Burma, Dem Voice of Burma	5955eu		
2330	0000		Lithuania, Radio Vilnius	7325na		
2330	0000		USA, Voice of America	6180va	7205va	
				11665va	13640va	15150va	
2330	2357		Czech Rep, Radio Prague	5930na	7345na	
2330	2358		Vietnam, Voice of	9840as	12020as	
2330	2359	DRM	Sweden, Radio	9800na		
2335	0000	Sun/Mon	Austria, Radio Austria Intl	9870sa		
2343	2368	twhfa	Austria, Radio Austria Intl	9870sa		

Military HF Comms Alive and Well

I always chuckle when I read comments on various newsgroups that HF comms are dead. In one sense they are right; the higher bands are dead. But it isn't due to a massive migration of services from the HF bands. It is because the higher frequencies are not propagating well right now, because we are at the bottom of Sunspot Cycle 23. Those higher frequencies are not as good as they were five years ago. And as we move into the summer months, static levels and ionospheric absorption levels on the lower frequencies will rise due to the longer daylight hours, and they will not be in great shape for distant HF reception then, either.

But this isn't usually what such pessimists are talking about. Their claim is that various radio services are leaving the HF spectrum in droves and HF is quickly becoming a waste land with "nothing" left to monitor. And nothing could be further from the truth. There is still a lot to hear on the HF utility bands.

In this edition of *MT Milcom* I have listed over 300 frequencies that were heard from various military organizations scattered around the world during a one-week period on the shortwave bands. As you can see by examining our list, there is still a lot to listen for on shortwave radio frequencies.

And, if you would like my latest HF Milcom by-frequency list, swing your browser to our *MT* Readers Only section of the *Monitoring Times* website. I post the latest complete list there and also post regular updates on my *MT Milcom* blog pages. All frequencies below are listed in kilohertz (kHz).

❖ One Week of Military Logs

Australian ADF-HFCS Net USB
3700.0 5878.0 9340.0 10212.0 11165.0 12172.0 20632.0 22868.0
Algerian Military ALE
3300.0 3331.0 5075.0 5236.0 5555.0 7705.0 7785.0
Brazilian Military ALE/USB   16333.0 16345.0
CanForce
CFH-Halifax FAX/RTTY   4271.0 6496.4 10536.0
MACS & VOLMET Trenton USB 6754.0 9007.0 11232.0
Military Net Digital/USB   4480.0
Chinese Military
CW   5227.0
Mil-Std-188-110A/141A ALE/USB 8049.0
Danish Air Force ALE/USB   6717.0 9035.0 11217.0
French Navy
Djibouti 300L 5N2 Stanag 4285 22447.0

FUV-Djibouti STANAG 4285 300L 5n2 7000.0
RBVITT-Dzaoudzi, Mayotte ARQ-E3/198/350 11521.8
Voice Net USB   3071.0
Georgia Military ALE/USB   5672.0
German Navy USB
2623.2 4356.5 8333.5 10190.7 10720.7 (also STANAG 4285)
Hungary Military ALE/USB   5762.0 8162.0
Indian Navy
RBSL RTTY 850/50   8500.0
VTG-Mumbai V marker CW8634.0
VTK-Tuticorin V Marker CW 5150.0
VTP-Vizakhapatnam V marker CW 6418.0 6507.0
Irish Air Force ARQ 2461.5
Irish Navy ARQ   4601.5
Israeli Air Force ALE/USB   6921.0 8521.0
Israeli Navy 4XZ-Haifa ISR-Hybrid modem 5512.5
Italian Coast Guard ICI-Rome USB 6967.5
Italian Navy
IDR-Rome RTTY 75 baud   8412.0
Voice Net (USB)   4724.5
Macedonia Military ALE/USB
6200.0 6860.0 6880.0 7010.0 7455.0 7475.0 7622.0 7890.0 7938.0 7965.0 8060.0 8130.0 10380.0
Malaysian Navy 9MR-Johor Baharu RTTY
850/50 encrypted   6473.0 8461.5
Mexican Army ALE/USB   8000.0 8045.0 8090.0
Morocco Military ALE/USB
7813.0 8875.0 11130.0 12160.0 14550.0
NASA Eastern Test Range
"Cape Radio" <Primary> USB 10780.0
National Guard Aviation CONUS Net ALE/USB
7648.5 8065.0 8183.0 10528.5 12087.0 12916.0
National Guard Aviation Arizona Net ALE/USB 8136.0
National Guard CONUS Net ALE/USB
4837.0 5817.0 5833.5 11441.0 13568.0 17458.5
National Guard New York ALE/USB 4562.0
National Guard/Air National Guard Ohio Aviation Net ALE/USB
3346.5 4000.0 5396.0 7562.0 7650.0 8057.0 10000.0
NATO-75 Cipher Stream 850/75
2819.6 5801.7 6753.0
NATO/DoD Link 11 data transmissions
2228.0 4170.0 4952.0 5039.0 5056.0 5171.0 5314.0 5705.0 6247.0 6255.0 6699.9 6790.0 9010.0
NATO/Royal Navy Secure broadcast NATO-75
850/75 KG-84   5052.0
NATO AWACS USB 6721.0
NATO Naval Trigraph Net FG/FH/FT USB 6721.5
Netherlands Navy PBB-Den Halder RTTY 2474.0

Norway Navy JWT-Stavanger USB 6727.0
Polish Military ALE/USB   5179.5 5220.0 6775.5 11475.0
Russian Air Defense Net CW 3322.0 6321.6
Russian Long Range Air Force REA4 Moscow
1000/50
2721.0 4179.0 5157.0 7018.0 9193.0
Russian Military
RUS-75   4093.8
81-81 3817.5 4537.5 4762.0 10444.0
CW   3162.0 3333.0 3354.0 3884.0 3930.0 5394.0 6207.5 6753.0 7002.0
MS-5/4800   2407.0 3803.7 4305.7 7932.0
Russian Navy CW (MX) Beacons
C-MX Moscow   4558.0 5154.0 7039.0 8495.0 10872.0
D-MX Sevastopol Ukraine 5153.7 7038.7 8494.7 10871.7
K-MX Petropavlovsk-Kamchatskiy 16332.3
M-MX Magadan 16332.4
P-MX Kaliningrad 2330.8 3593.8 3852.0 4557.8 5153.8
R-MX Ustinov   4325.9 5465.9
Russian Navy CW
RCV-Black Sea Fleet HQ Sevastopol, Ukraine   10201.0
RIT-Northern Fleet HQ Severomorsk 11155.0
RMP-Kalinigrad 3192.0
Singapore Navy ALE/USB   5220.5 8062.0
Spanish Air Force USB   6715.0
STANAG 4285
2843.0 4346.0 6277.6 6385.0 8122.0 8303.0 8331.0 8476.0 8542.0 8565.0 8634.0 9096.0 12713.0 13058.0 14724.0 17060.5 18365.0
UK Army Combined Cadet Force (CCF) USB 5343.0
UK Royal Air Force (RAF)
CRC (Command & Reporting Centre) at RAF Scampton "Blackdog" USB 6760.0
Kinloss Rescue-ARCC Kinloss USB 3930.0 5680.0
VOLMET USB   5450.0 11253.0
UK Royal Navy GYA-Northwood
Meteo Charts FAX 120/5768040.0
Unidentified ANDVT comms USB [probable USCG units)   8294.0
Ukraine Military CW   6804.0 6809.0
USAF Aerial Refueling Discrete USB 6761.0
USAF Civil Air Patrol ALE/USB 8012.0
USAF HF-GCS Scope Command ALE HF Network ALE/USB
3137.0 4721.0 5708.0 6721.0 9025.0 11226.0 13215.0 15043.0 18003.0 23337.0
USAF MARS HF Phone Patch Net USB 13927.1
US Armed Forces Network Key West FL USB 12133.5
US Army Aviation
2-135 AVN ALE/USB   5135.0
3-227 AVN ALE/USB   4451.0

Australian Defense Force P-3 aircraft on patrol

Net ALE/USB   7003.0 8003.0 8521.0
8714.0 12168.0
CONUS Net ALE/USB   3286.5 4521.5
4611.5 5554.5 6908.5 6911.5 7632.0
7667.5 9295.0 10680.0 10691.5
10821.0 11170.5
Iraq Net ALE/USB   5542.0 5602.0
6486.0 6906.0 7839.0 8950.0 11067.0
Net WAROPS (1/228th Avn Regt ("Winged
Warriors") Operations-Soto Cano AB, Hon-
duras ALE/USB   8972.0 10692.5 11628.5
US Army Command Emergency Operations
Net ALE/USB
3275.0 3285.0 5088.5 6985.0 7448.5
US Army Corps of Engineers Net ALE/USB
9122.5
US Army Flight Following Service (AFFS) ALE/
USB   8065.0
US Army Iraq Net ALE/USB   5118.0 5296.5
11047.6
US Army/National Guard Aviation CONUS Net
ALE/USB
7650.0 7718.5 7819.0 8171.5 8181.5
8184.5 9081.5 11439.5 11551.5
US BICE COTHEN ALE/ANDVT/USB
5732.0 7527.0 8912.0 10242.0 11494.0
13907.0 15687.0 18594.0 20890.0
23214.0 25350.0
US Coast Guard
CAMSLANT Chesapeake ANDVT/USB
8337.6
Fixed Wing Air/Ground USB
5696.0 8983.0
MAP Ops ALE/ANDVT/USB 10993.6
NMF- Boston FAX 9110.0
NMG-New Orleans FAX   4317.9 8503.9
12789.0 17146.0
NMG-US Coast Guard New Orleans "Per-
fect Paul" weather USB   8502.0
US DISA Non-secure Internet Protocol Router
Net (NIPR) ALE/USB
3068.0 4745.0 5684.0 8965.0 10600.0
10830.0 11199.0 13242.0 17973.0
20631.0
US DISA Secure Internet Protocol Router Net
(SIPR) ALE/USB
3113.0 5702.0 5902.0 6715.0 8968.0
9044.0 11181.0 15091.0 17976.0
27870.0
US DoD Unidentified Net MEDOPS/COROPS
ALE/USB   5500.0
US Federal Emergency Management Agen-
cy National Radio System (FNARS) USB
7348.0 10588.0
US Military HF-GCS Primary USB
11175.0
US Military Task Force Afghanistan ALE/USB
9190.0
US Navy CSG Voice Coordination Net USB
5517.0
US Navy FACSFAC VACAPES USB
4372.0
US Navy Okinawa NATO-75 850/75 KG-84
12683.0
US Navy Tactical Support Center (TSC) - Atlan-
tic USB 8971.0
US Navy USS Enterprise
Carrier Strike Group (CSG) USB
3167.0
CSG Air Defense Voice Coordination Net
"EW" USB   5078.5
CSG Force Track Coordinator (Link-11/
Link-16) "EF" USB   4414.0

US SHARES SCN ALE Net ALE/USB
5711.0 11217.0 17487.0
US Southcom Flight Monitoring Facility (FMF)
"Smasher" USB   11205.0
Uzbekistan Military ALE/USB 5260.0 5270.5
7700.0
Venezuela Army ALE/USB   8060.0 8187.0
10600.0 14569.0
Venezuela Coast Guard/Riverine Forces ALE/
USB   8810.0 9380.0
Venezuela Navy ALE/USB   8270.0 8500.0
9017.0

❖ Milair Frequency Changes

Our intrepid reporter Jack NeSmith in Florida checks in with few of the latest milair frequency changes.

Alice International, TX KALI
290.450 Kingsville Approach (ex-300.400)
Allen AAF, AK PABI
125.325 Tower Primary (ex-119.800)
Barksdale AFB, LA KBAD
227.400 Pilot to Metro (Meteo)
307.025 ATIS
Cameron Memorial, MO KEZZ
118.400 Approach (ex-119.000)
Charleston AFB, SC KCHS
126.000 Tower
127.325/381.600 Clearance Delivery (ex-118.000)
134.100/349.400 Base Command Post
(New callsign Palmetto Ops)
306.925 Charleston Approach Control
Columbus AFB, MS KCBM
118.150/363.125 North Approach Control
<Channel 5>
126.075 Approach Control (ex-120.400)
132.025/291.650 Approach Primary/Class
C (ex-127.950
263.150 South Approach Control
269.550 Clearance Delivery (ex-289.600)
379.925 Tower (ex-269.550)
Columbus AFB Auxiliary Field, MS 1MS8
363.650 RSU
Corpus Christi NAS, TX KNGP
340.200 Local Control North Primary
360.200 Local Control South Primary
Dover AFB, DE KDOV
257.875 Approach/Departure Control
Elmendorf AFB, TN PAED
128.800/306.925 Clearance Delivery
Fairbanks International, AK PAFA
120.900 Murphy Dome RCAG
133.500/233.700 Hill 3265 RCAG (ex-336.400)
Fayetteville Regional, AR KFAY
125.175/397.850 RTS
Fort Benning/Lawson AAF, GA KLSF
118.100 Local Control
118.700 ATIS
121.025 GCA
121.700 Clearance Delivery/Ground Con-
trol (ex-121.700/121.075)
121.900 Ground Control
291.100 Local Control/Ground Control
Fort Drum/Wheeler-Sack AAF, NY
139.600 R-5201 North (ex-134.100)
Fort Greely/Delta Junction, AK
119.800/235.775 Local Control (ex-125.325/254.275)
Fort Lewis/Gray AAF, WA KGRF
30.025 Rattlesnake (NFM)
120.100/290.900 Approach Services (Se-
attle Approach/Departure Control)
128.200 GCA Services (Civilian)
139.700 Local Control (ex-119.325)
139.925/239.000 Final Control
Fort Rucker/Cairns AAF, AL KOZR
273.425 Local SOD
Grand Forks AFB, ND KRDR
360.700 Clearance Delivery (ex-359.300)

Jacksonville NAS, FL KNIP
360.200 Tower Primary
Kansas City International, MO KMCI
118.400 Approach (East of runway 01-19)
(ex-119.000)
128.375 ATIS (ex-126.625)
Kingsville NAS, TX KNOG
290.450 Approach/Departure Control (ex-300.400)
Luke AFB, AZ KLUF
118.150/363.125 North Approach <Chan-
nel 5> (ex-120.500/282.250)
Mayport NAS, FL KNRB
235.675 Radar
239.300 Tower Primary
288.325 Tower Secondary
323.250 Radar
379.025 Radar
New River MCAS, NC KNCA
119.500/325.000 MCOLF Oak Grove
"Blackburn"
253.300 Base Operations
Seattle ARTCC, WA
127.050 RCAG (ex-135.550)
290.550 RCAG (ex-282.300)
Springfield -Beckley Muni, OH KSGH
255.400 Ground Control (ex-261.100)
Vagabond AAF, WA KFCT
30.025 Rattlesnake (NFM)
139.700 FCT CTAF
Vance AFB, OK KEND
126.750 Approach Control West
Whitehead AFB, MO KSZL
119.250 Radar Arrival (ex-120.250)
Yuma MCAS, AZ KNYL
274.000 Yuma Range Control

❖ Aussie HF Military Network

Many of the military services worldwide have been consolidating their HF communications services into joint systems. Here in the US, DoD consolidated many JCS HF nets (i.e. Navy HICOM etc) into the HF-GCS network. In the UK, several older networks have now been combined into the RAF TASCOMM.

Now we have another national military service net which has consolidated several service nets into one. The Australian and New Zealand military services now have one network known as the Australia Defense Force (ADF) High Frequency Communications System (HFCS), with the main station located at Canberra. They have seven main HF voice frequencies that carry the bulk of their voice comms listed below.

ADF-HFCS Voice Contact Nets (VCN) "Australia Control"
3700.0 kHz   0900-2100Z <VCN-1>
5878.0 kHz   0900-2100Z <VCN-2>
9340.0 kHz   H24 Primary Net Freq
<VCN-3>
10212.0 kHz H24 <VCN-4>
12172.0 kHz H24 <VCN-5>
20632.0 kHz 2100-0900Z <VCN-2 >
22868.0 kHz 2100-0900Z <VCN-1>

They also have an extensive list of HF discrete frequencies. You can learn more about this system (including their registered discrete frequencies) on the Shortwave Listeners Delight website at
http://members.optusnet.com.au/vent-mond (main page) **... /page/raaf_rnzaf. htm** (frequencies) **... /pages/jp_2043.htm** (JP2043 High Frequency Modernisation Project). And that does it for this month. Until next time, 73 and good hunting.

FED FILES

GOVERNMENT COMMUNICATIONS

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A Super Week in Miami

Super Bowl XLI in Miami this past February was an event that provided some insight into planned federal response at large public gatherings as well as federal interoperability with local public safety agencies. I was fortunate enough to be working as part of the vast television broadcasting pool covering this event for the world. That allowed me some time to monitor the activities from the main event site, Dolphin Stadium.

Major events that require federal involvement with security appear to have the Justice Department and the FBI acting as the lead in coordinating activities. Past Super Bowl games as well as events like the Rose Bowl in Pasadena, California, have shown that many FBI and Justice allocated frequencies in the VHF federal band are used as primary channels at these events. And this Super Bowl was considered a Level One national security event, right behind a presidential inauguration in importance.

Besides security coordination for events like the Super Bowl, I suspect that these gatherings also provide an excellent opportunity for training in a real-world situation. During the week leading up to the big game, federal and local police agencies took turns practicing tactical entries and maneuvers into the stadium complex. This event also provided some exercises in interconnecting various radio communications systems. From what I heard over the air, they were able to link local public safety agencies to federal communications systems through equipment set up at the command center for this event, the Joint Operation Center (JOC).

As one might imagine, the entire radio spectrum was extremely busy with preparations leading up to the big game. The UHF business bands were full of activity at the stadium as well as wide-area activity covering the parties and hotel activities of the NFL, security, media and sponsors. The 800 MHz public safety trunked systems of Metro-Dade and the Miami Police were active with security and support operations, as well as the 800 MHz trunked radio system of Broward County public safety. Additional traffic from local agencies as well as Florida State police agencies were heard on some of the national 800 MHz conventional channels.

I arrived in Miami loaded up with radios to help search the spectrum. I had my Uniden 396T, 796 and 996T radios, along with my PRO-96 and Yupiteru MVT-7100 hand-held scanners, and I could not have done without my Optoelectronics Optocom computer-controlled receiver, running Probe software.

Once on location at Dolphin Stadium, I realized that there were going to be some challenges trying to monitor so much at once. There was so much RF being transmitted from in and near the stadium, I ended up using very low-gain antennas and attenuators on all the radios, so I was really only monitoring what was happening nearby.

During the weekdays prior to the Super Bowl, there was a lot of activity on the federal spectrum with testing of new equipment, frequencies and the digital "bridges" that allowed the interconnection of different radio systems. If I had a nickel for every time I heard "Testing 1, 2, 3…" on a federal frequency during that week, I could retire now! But it did provide a great deal of information on who was using what frequency and what different agencies were on location. I was initially surprised at the lack of encryption used during all the testing and through the Super Bowl. But a source indicated to me that interoperability was the primary goal of these interconnected systems, so encryption was used only as required and not left on full time.

As I mentioned earlier, many agencies took turns doing tactical training exercises during the build up to the Super Bowl weekend. The most interesting were the Custom & Border Protection Air and Marine Division helicopters that rehearsed some tactical maneuvers at Dolphin Stadium on the Wednesday prior to Super Sunday. Three UH-60 Blackhawk helicopters from Washington, D.C., using the call signs "CHOCK 1", 'CHOCK 2" and "CHOCK 3", took turns landing on the football field in the stadium then retrieving their personnel and taking off. After a couple of hours of training, they departed to North Perry airport for refueling and food, and then returned for additional tactical training that evening.

Although this is by no means all of the federal channels used for the Super Bowl week, these are what I was able to log and confirm as being used at my location at the stadium. Some I was able to identify and some remain a mystery:

163.1000, P-25   Unknown agency, but this is a federal common frequency.
163.8625, P-25   Input to one of the FBI JOC repeaters
163.8875, P-25   Input to one of the FBI JOC repeaters
163.9000, P-25   Input to the 171.4375 Federal Interoperability repeater
164.4000, P-25   US Secret Service PAPA frequency
164.5375   Unidentified agency or user (Allocated to US Fish & Wildlife, Department of the Interior)
164.6500, P-25   US Secret Service TANGO frequency
164.9625, 100.0   DHS Customs and Border Protection Air Marine Division Helicopter operations at Dolphin Stadium. I never heard this channel identified by a NET or TAC number, although it has been used in Florida for many years..
165.2375, 100.0   DHS Customs and Border Protection NET 1 (repeater) and TAC 1 (simplex), used by multiple air assets near Dolphin Stadium. Most were communicating with the JOC.
165.2875, P-25   ATF simplex use at Dolphin Stadium.
166.4375, 100.0   DHS Customs and Border Protection, input to NET 1 repeater.
167.2625, P-25   FBI Joint Operation Center
167.4375   FBI

All the vehicles headed into the secure area of Dolphin Stadium are swept by the mobile VACIS or Vehicle and Cargo Inspection System. (Courtesy DHS Customs & Border Protection)

167.5375, P-25   FBI Joint Operation Center

167.6125   FBI

167.6625, P-25   FBI Joint Operation Center, many radio checks early during the week, but later heard many ID checks, possibly checking incoming vehicles at the VACIS mobile truck scanning setup.

167.7625, P-25   Known South Florida FBI repeater

168.0125   Unidentified agency or user (Allocated to US Fish & Wildlife, Department of the Interior)

168.8750, 103.5pl DHS Customs and Border Protection

169.4500, 100.0 DHS CBP NET 2 (CBP Air Marine Division activity noted here all week)

169.5500   Unidentified agency or user (Likely Custom & Border Protection or Immigrations and Customs Enforcement)

169.5750, 167.9 FBI Operations

170.8250, 167.9 FBI Joint Operations Center

171.0250   Unidentified agency or user

171.4375, P-25   Federal Interoperability repeater. Many agencies heard here including the JOC and Metro Dade Police and Metro Dade Fire Rescue. Look for this frequency to remain in place for future use in South Florida.

173.0750   Unidentified agency or user (Likely FBI / Justice Department)

413.2750, D431   USAF Thunderbirds ground communications with lots of traffic regarding weather conditions for the national anthem fly-over.

I am certain there were more federal frequencies in use for the Super Bowl event than those that were heard and logged. Surprisingly, we heard nothing on known Department of Defense radio nets, but they were part of the Joint Operations Center staff. And special thanks to the local South Florida scanning group who helped listen and confirm many of the frequencies listed above.

❖ Bureau of Prisons Project On-Line

I have recently completed the initial version of a list of all the radio systems used by facilities of the Federal Bureau of Prisons, part of the Justice Department. Most BoP facilities have moved or are in the process of moving to UHF trunked systems for their communications needs. Some are P-25 digital, some are still analog. I have tried to collect all the available information from various sources into one list.

That document is posted on the *Monitoring Times* web site in the "MT Reader Only" area at **www.monitoringtimes.com/mtsubscriber/** You will need the current password that appears in each month in *Monitoring Times* to enter this area and access this file.

I will continue to update this listing as I receive additional information. If you have any corrections or updates to this list, please feel free to send them along to us here at the *Fed Files*.

❖ Federal Scanning in Puerto Rico

I recently had a chance to visit Puerto Rico for work and brought a few scanners along for the trip. Since Puerto Rico is a territory of the United States, the federal radio band plans are the same as they are here on the mainland. While much of the communications on these frequencies were in English, Spanish is the dominant language spoken in Puerto Rico, so I did note quite a bit of Spanish on some federal radio nets.

I only had short periods to search out activity in the federal bands, so here's what I found active:

157.1500   USCG SECTOR San Juan, clear and GREEN (encrypted) mode

157.1750   USCG SECTOR San Juan, clear and GREEN (encrypted) mode

162.3000   Data bursts

162.8750, P-25   Unidentified, but most likely Immigration and Customs Enforcement

162.9000, P-25   Encrypted, most likely ICE

163.2375   Unidentified agency or user

165.2375, 100.0 DHS Customs, analog with some DES encryption. Lots of Over-The-Air-Rekeying (OTAR) of the radios, day and night!

166.2125, D226   Possibly US Post Office

166.4375, 100.0 Input to DHS 165.2375 repeater

167.8625   Paging voice & data, Veterans Affairs Medical Center in San Juan

168.5250   Unidentified agency or user (Possibly Department of Interior)

168.8500   DHS Customs and Border Protection, OTAR data bursts.

169.3000, P-25   Input to 172.9 repeater

170.6750   DHS Customs and Border Protection

170.7375, P-25   Possible input to 162.9

170.7500, P-25   Federal Building security in Hoto Rey, PR

172.9000, P-25   DHS TSA at SJU airport

406.6125, P-25   BoP trunked system, Metro Detention Center Guaynabo, PR

408.3500, P-25   BoP trunked system, Metro Detention Center Guaynabo, PR

409.2125, P-25   BoP trunked system, Metro Detention Center Guaynabo, PR

409.8000   Data bursts (FAA)

410.2000, P-25   BoP trunked system, Metro Detention Center Guaynabo, PR

410.4000, P-25   BoP trunked system, Metro Detention Center Guaynabo, PR

414.7500, 82.5   US Postal Service, Postal Inspection Service

418.3000, 82.5   US Postal Service, Postal Security Service

❖ Fed Files Myths and Legends:

Secret Service "Suit Radios"

If you run an Internet search for frequencies used by the Secret Service, many web sites will include some federal UHF frequencies that are labeled as "Suit Radios" or on some lists as "Wrist Watch Radios." Some lists have offered descriptions of these radios as being small, lightweight hand-held units that

Interior of the Super Bowl JOC, or Joint Operation Center in Miami, Florida (Courtesy of the DHS Customs & Border Protection)

are actually sewn in to the agent's suit jacket lining. Other lists describe these frequencies as coming from small, "Dick Tracy" type transmitters worn by the Secret Service agents that allow them to talk in to their coat sleeves rather than picking up a hand-held radio.

These mysterious frequencies have been floating around for many years now, even before the technology to make them a reality existed. So where did these come from? Who has ever heard these in use? I've always suspected that these descriptions were misunderstandings that were passed along from list to list over many years without really knowing where they came from.

The reference to "Wrist-Watch" radios comes from the popular image of Secret Service agents talking into their wristwatch or their sleeves. In reality they are talking into a small microphone and transmit switch held in the palm that is wired to the agent's portable radio.

At every event in which I have been close enough to verify it with my own eyes, all the Secret Service agents and motorcade vehicles carried VHF radios. That's not to say that the Secret Service doesn't have UHF frequencies available to them. For many years the uniformed division of the Secret Service used to use UHF frequencies for their operations at the White House and in Washington, DC. But, since the integration of the Secret Service into the Department of Homeland Security, they have switched to all VHF frequencies, most likely to ensure seamless interoperability with other DHS agencies. There is also the mysterious Secret Service portable UHF trunked system that seems to surface in the strangest places.

However, some listeners insist that they overheard motorcade and other security operations on UHF frequencies during events involving Secret Service protective details. While it's possible that the Secret Service Uniformed Division were active at some events, it's also possible that other federal agencies, perhaps the State Department, were involved with the event.

And speaking of the Secret Service, we'll take a closer look at their radio communications next time we get together. So see you in July!

Iden Rogers
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Airport Information for Listeners

It goes without saying that much aircraft activity centers around airports, particularly metro area airports. If you are new to aircraft communications listening, the following airport information should make the pursuit more understandable and more enjoyable. For others, this can serve as a helpful review.

By no means do you have to live close to one of the nation's busiest airports to enjoy airport communications. If you are curious about the ranking of the thirty busiest airports in North America (as of 2005), take a look at **www.aci-na.org/asp/traffic.asp?art=217** The results may surprise you. You will also find a link there to an Excel spreadsheet file that ranks the 190 busiest airports.

Ok, let's take a look at the airport stuff!

AirNav.com

One good source for airport information is AirNav.com at **www.airnav.com/airports** Here, you can enter a city name or an established airport identifier, such as "LAX" for Los Angeles International.

For a given airport, among the various types of information offered by AirNav.com is the altitude above sea level (MSL), the name of the Sectional Chart, and the Air Route Traffic Control Center (ARTCC or "Center") that includes the airport.

Frequency listings are given for Clearance Delivery, Ground Control, Tower, Approach / Departure, and when they exist, frequencies for ATIS (Automatic Terminal Information Service), AWOS (Automated Weather Observing System), and ASOS (Automated Surface Observing System).

Nearby VOR and NDB navigational stations are listed. VHF Omnidirectional Range (VOR) transmissions are in the 108-118 MHz range and Non-Directional Beacons (NDBs) are mostly in the 200-415 kHz range. The names of these navigational stations are frequently mentioned in pilot-controller exchanges, so becoming familiar with the ones in your listening area can help you understand what is being referred to.

Runway information is given in some detail. Runway numbering, in particular, is important for listeners to understand. It is explained below.

Near the bottom of the airport's listing are downloadable STARs (Standard Terminal Arrivals), IAPs (Instrument Approach Procedures), and Departure Procedures in PDF format. The procedure names are frequently part of pilot-controller communications and important to listening.

Many airport listings will include an aerial photograph which helps to put a "face" on an airport. There is also part of a Sectional Chart by SkyVector.com. Clicking on it will bring up an expanded display which helps to put the airport's location in better geographical perspective.

Some airport listings will include a link to an FAA airport diagram in PDF format. These show runways, taxiways, terminal buildings, hangers, fire houses, and more. If some airports do not include an airport diagram at AirNav.com, try: **www.faa.gov/RunwaySAFETY/naco.cfm**

At AirNav.com, you can click on "Browse by U.S. State" to bring up a listing of all airports in a given state. Clicking on "Advanced Search" gains access to a useful search with additional input qualifiers: "1. Tell us about a nearby place." There, you enter a city, town, Zip Code, an airport identifier, or geographic coordinates, then in "2. Tell us about the airfields you are looking for," you can select airfields by type – "Airports, Balloonports, Gliderports, Heliports, Seaplane bases, STOLports, and Ultralight Flightparks," and additionally select for "Public, Private, and/or Military." In "3. Where do you want to search?" you enter the search radius, the default being twenty miles. And, after all the selections are made, click on "Search for airfields in this vicinity."

❖ Airport/Facility Directory

The *A/FD* is another resource with similar information for all U.S. airports, but it's more cumbersome to access. Each airport search result is in PDF format. Go to **http://avn.faa.gov/index.asp?xml=naco/online/d_afd** and then scroll to and click on "*digital* - Airport/Facility Directory" under "Product."

After making a selection using the down arrows, but before clicking on an airport "View PDF" link, the search result page will include "Legend | Supplemental" links. The "Legend" is a 500 kb, 20 page PDF download that has abbreviations, acronyms, and symbols used in the directory. Included is a sample airport listing with its components explained over several pages. It is worth downloading and saving for reference, whether or not you plan to use the *AF/D* airport listings. Forget "Supplemental," a 16 MB, 198 page PDF download.
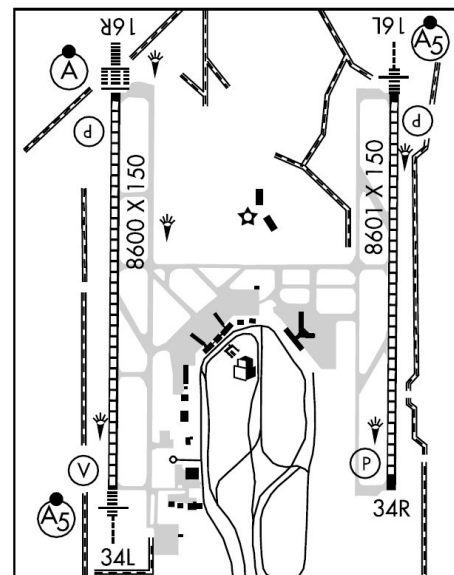
Fig. 1- Parallel Runways at Sacramento International (SMF). From A/FD. Courtesy FAA.

If you are in the downloading mood, you will see a "Chart User's Guide" link near the top left of the *A/FD* search page. There, you will find VFR (Visual Flight Rules) and IFR (Instrument Flight Rules) chart symbol PDF downloads. These are a must for anyone who uses or who is curious about charts as an aid to monitoring.

❖ Airport Identifiers

Airports have three-letter identifiers. Place a "K" (which stands for U.S.) before the three letters and it becomes an international identifier, so Los Angeles International is both LAX and KLAX. If you hear an airport identifier used on the radio, you can look it up at **www.airnav.com/airports** Also, you can find the identifier for a specific airport by entering its name or city.

❖ Airport Communications

There are different categories of communications at airports. In "Clearance Delivery" aircraft get their clearance before departing. It includes information about the initial part of the route, and the pilot will always read it back to the controller to confirm correct copy. If you plan to follow a particular aircraft right from takeoff, do listen to the clearance and take note of the specific Departure frequency, because this is the only time it will be given.

On final for Runway 9R at Hartsfield - Jackson Atlanta International Airport (ATL). The "9R" means the right of two parallel runways with a magnetic heading of 90 degrees / landing directly East. Photo by Michael Martin; used by permission.

After that aircraft is airborne, the Tower will only say "contact Departure" without giving the frequency.

"Ground Control" is where all the taxi instructions are given for both departing and arriving aircraft, and sometimes the Clearance Delivery function will occur on this frequency.

The "Tower" controls aircraft in the vicinity of the airport for departing and arriving aircraft as well as those passing through the airport's airspace. The Ground Control function can occur on the Tower frequency at some airports during periods of low activity.

"Approach Control" and "Departure Control" are functions of the area TRACON (Terminal Radar Approach Control) facility. The Tower hands off departing aircraft to Departure Control and Approach Control hands off landing aircraft to the Tower. AirNav.com and the *A/FD* each provide all these frequencies.

❖ ATIS Broadcasts

Controllers and pilots will mention ATIS (Automatic Terminal Information Service) broadcasts in their communications at larger airports. For airports that have ATIS, the frequency will be listed with other airport frequencies. ATIS broadcasts are continuous, pre-recorded,

Control towers are the heart of airport pilot-controller radio communications. Courtesy FAA.

and repeat until updated. Each version is assigned a succeeding letter of the alphabet, expressed by using the military phonetic alphabet. If the previous version was "Gulf," the current version will be "Hotel." The start of each cycle of the recording will state the airport name and the version, as in "Information Hotel."

Using such recorded broadcasts saves air time and reduces controller workload by offering current airport information to arriving and departing aircraft. Pilots needing ATIS information often listen at times when cockpit workloads are reduced.

ATIS broadcasts include weather information, the altimeter setting (current barometric pressure for calibrating altimeters), the current runway(s) in use, notices of airport hazards like construction work, migratory birds, or problems with runway lighting or with radio navigational aids.

❖ AWOS and ASOS

AWOS (Automated Weather Observing System) and ASOS (Automated Surface Observing System) are automated and broadcast continuously in computer voice in the VHF aircraft band. They will be listed among the VHF airport frequencies for the airports that have them. In the FAA's words: "The AWOS sensors measure weather parameters such as wind speed and direction, temperature and dew point, visibility, cloud heights and types, precipitation, and barometric pressure." and "ASOS provides weather observations which include: temperature, dew point, wind, altimeter setting, visibility, sky condition, and precipitation."

In addition to providing useful information to listeners, they, along with ATIS broadcasts, can serve as continuous ground level signal sources in the VHF aircraft band for evaluating antennas and scanner sensitivity. Switching back and forth between two antennas or two scanners will show fairly quickly if one is better than the other. For such an evaluation, use as many ground stations across the band as you can find.

❖ Runway Numbering

Runway numbers are mentioned frequently by controllers at airports or by Approach Control. "Runway Two Seven," by adding the final omitted zero, becomes "270." This means that when landing on this runway, the pilot is using a magnetic compass direction of 270 degrees, or directly West in this case. At other times, if the wind is different, an aircraft landing on this same stretch of pavement in the opposite direction would be landing on "Runway Nine," which is 090 degrees on a compass, or directly East.

Larger airports can have parallel runways, with planes simultaneously landing and departing. Sacramento International Airport (SMF) offers a great example. The airport has two separated stretches of pavement parallel to each other. When approaching from one direction, there is "Runway One Six Left" (RWY 16L)

and "Runway One Six Right" (RWY 16R), both with a compass direction of 160 degrees from magnetic north. In the opposite direction, there are RWYs 34L and 34R. In other words, RWY 34L is the same stretch of pavement as RWY 16R. See Figure 1.

❖ Published Procedures

STARs, IAPs, and Departure Procedures were briefly mentioned above. Using the same Sacramento International page at AirNav.com as an example, scroll to near the bottom. You will see the various "published" procedures listed by name, such as "Tudor One," "ILS RWY 16R," and "Dudes Nine." Since controllers and pilots both have reference to the exact details for each procedure, they need only be called out by name on the radio rather than repeating all the details.

❖ Pilot/Controller Glossary

When air traffic controllers and pilots communicate with each other on the radio, they use very specific terms and phrases. To increase your enjoyment as a listener to aircraft communications, it is helpful to have them become part of your vocabulary. This first link is searchable on line: **www.faa.gov/airports_airtraffic/ air_traffic/publications/atpubs/PCG/index. htm** This next one is a 585 kb, 144 page PDF download which can be saved for easy reference: **www.faa.gov/airports_airtraffic/air_traffic/publications/media/pcg.pdf**

❖ FlightAware.com

Last, but certainly not least, FlightAware at **http://flightaware.com/live** is an excellent resource for those with an interest in airliner and other IFR flights. Here are some of the things you can find there: Flight tracking of individual flights with an updating graphic that shows the flight's progress, a flight's route information, IFR (excluding most military) flights in the general area of any U.S. airport you select, airline departure and arrival schedules by airport, "Airborne by Operator," "Airborne By Aircraft Type," and more. And, it's free. Lots of things to click on and try. The May 2006 issue of *MT* elaborates on some of the site's features. The FlightAware FAQ may answer some things as well: **http://flightaware.com/about/faq. rvt**

❖ *MT* Anthologies

Some of the above topics have been covered in much greater detail in earlier columns. Don't forget that previous *MT* issues are available on CD at: **www.grove-ent.com/mtantindividual.html**

See you next time. Send questions and comments.

DX Destinations

By far, the most common complaint I hear from longwave listeners is noise – both natural (QRN) and man-made (QRM). Although there isn't much we can do about natural static – other than choose our listening times carefully – man-made static is another story. In the past we've covered ways of locating and curing static problems, but this month we'll take an entirely different approach – moving away from the noise.

In case you haven't guessed, I'm talking about DXpeditions. Hams are famous for these events. They pack up their gear and head for exotic lands for the sole purpose of putting a station on the air. Often, they are the only station operating from the chosen location – much to the joy of award-chasing hams "back home."

Listeners can also go out on DXpeditions. Perhaps their trips won't take them to truly exotic lands (although they might) but just getting away from urban centers can be very rewarding when it comes to adding new catches to your log.

Location, Location

Finding the right spot for your DXpedition is the main ingredient to success. A lot will depend on whether you're going with a large group, or plan to have only a few attendees at the site. In its simplest form, an event can be held at a campsite by simply pitching tents and setting up a small table to hold radio equipment. (See Figure 1.) This arrangement is well suited to warmer climates.

For larger gatherings, indoor accommodations are the preferred choice. A few years ago, I joined a group of DXers who rented a large cabin in the lower Adirondacks during the month of November. Since it was the off-season for camping, the cost was quite reasonable. The site included smaller cabins around the main building that served as sleeping quarters. Such an arrangement allowed around-the-clock DXing during all kinds of weather.

Another primary consideration for longwave events is noise level. Try to pick a location at that is at least five miles away from high voltage electric lines, and does not have fluorescent or sodium-vapor lights nearby. (It may be possible to have such lights turned off during your event.)

Before committing to a given location, I recommend surveying the site with a portable LW receiver to check for noise. While this does not guarantee quiet conditions at the time of your event, it will give you some idea of what to expect and may help avoid an unpleasant surprise when you're trying to pull in a weak signal.

Scouting visits also allow you to evaluate the possibilities for installing temporary antennas. For conventional wire antennas, you'll want to have some sturdy trees within 100 feet or so to secure your line. Users of active antennas or loops may only require a small post driven into the ground.

By the way, when using wire antennas, don't feel that you must string out a quarter-mile of wire for acceptable performance. I've found that under the quieter conditions of a DXpedition, just 75 feet of wire is often sufficient. (In fact, many portables suffer overloading when a long antenna is used.)
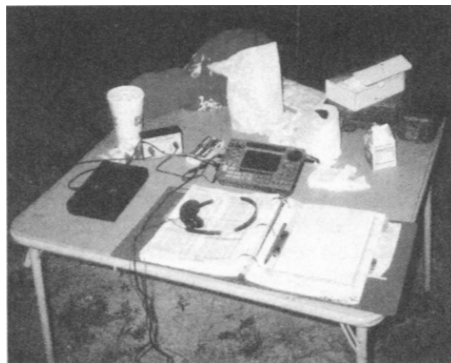
Figure 1. The Essentials for a DXpedition – Receiver, headphones, beacon guide, snacks and a carton of milk! Photo by Dick Pearce (VT) taken while on DXpedition in Florida.

Gear Checklist

Below is a brief checklist of things you may want to take on your DXpedition (besides your receiver, of course). The list is intended as a starting point and can be customized to fit your individual needs.

☐ Antenna wire, insulators, rope
☐ Headphones
☐ Reference books (beacon guide, maps, MT, etc.)
☐ 2-meter handheld (or a cell phone)
☐ Sleeping bag, pillow
☐ Flashlight
☐ Battery-powered alarm clock
☐ Toiletries
☐ Logsheets, pencils
☐ Food, snacks
☐ A good non-radio book
☐ Camera
☐ Tape recorder
☐ Small parts & equipment (fuses, connectors, electrical tape, multimeter, hand tools, etc.)

Communications

As noted in the list, it is desirable to have some form of two-way communication while on a DXpedition. Wired phones may not be readily available, so I suggest taking along your 2-meter handheld (if you're a ham), or a cell phone.

Two-way communication was invaluable at an event I attended a few years ago. There were no phones, and we needed to report a fire, so using a 2-meter radio, we contacted a distant ham who alerted the local authorities. As the local fire siren began to wind up, I knew that ham radio had done its job. (Try doing that with the Internet.)

The Big Day

If you're going to a DXpedition, I recommend getting there early. For weekend events, I like to arrive on Friday afternoon while there is still some daylight left. This allows time for setting up stations, stringing antennas and getting the bugs worked out of the installation.

As other DXers arrive, welcome them to the site and offer to assist them with setting up their equipment and antennas. Before long, a brief meeting should be held to introduce the participants, discuss emergency procedures, food arrangements, facilities, etc.

Beyond that, there's not much more to be said. The rest of the time is yours to tune the bands, read, or visit with other DXers. I think you'll find, as I have, that it's hard to beat the quieter conditions and camaraderie offered by a DXpedition. Have fun, and be sure to send some pictures to *Below 500 kHz*!

I'd like to hear from listeners who have participated in a DXpedition. Where did you go? What did you hear that you couldn't hear at home? Do you have any tips beyond what we've discussed here? I look forward to hearing from you either by e-mail or postal mail.

Hamfest Season

It's time for my yearly plug of what I believe is one of the best hamfests in the U.S! The Rochester (NY) Hamfest is celebrating its 73rd year in 2007, and the event has historically been a great place to find LF-related gear and components. This year's fest will be held June 1, 2, 3 at the Monroe County Fair & Expo Center. Full information is available online at: **www.rochesterhamfest. org/**.

You may even find me rummaging for WWII "Command Series" transmitters and receivers (AN/ARC-5). I've recently developed an interest in these unique airborne sets, with the goal of getting a complete ARC-5 station up and running on 80 or 40 meters. You can't beat hamfests for finding vintage gear and related accessories.

73, Best LW DX, and see you next month.

Pirate Radio and the Media

❖ Global Crisis Watch

Veteran clandestine radio journalist Martin Schoech in Germany reminds us that he is producing a **Global Crisis Watch** podcast that contains considerable up to the minute news on clandestine radio stations on a worldwide basis. If you want to listen to this informative and useful podcast, check out the web site where the feed originates. You will find it at **www.globalcrisiswatch.com**

As they define their mission: "Global Crisis Watch is a weekly current affairs podcast that brings listeners to the front lines on the War of Ideas with people who are fighting tyranny and terror with the pulse of freedom." The podcasts normally run for about 45 minutes.

❖ Florida Pirate Web Site

From time to time we mention the excellent web site maintained by Terry Kreuger. It covers breaking developments on DXing Florida pirate radio stations, most of which are low power FM operations. You can see Terry's web site for yourself at **http://home.earthlink.net/~tocobagadx/flortis.html**

Another interesting log came in from Horacio Nigro in Uruguay, who has heard a couple of North American pirates, but who is still struggling to identify this tremendous DX.

❖ Pirate Radio USA Film

CBC radio in Canada aired a feature in early February on **Pirate Radio USA**, a Seattle, WA, pirate formerly operating on FM. The station has produced a film about pirate radio that is being shown intermittently in theaters in both Canada and the United States. We thank Walt Salmaniw for the tip on this one. Keep your eyes open in case this film is shown in your area.

❖ Mainstream Press Coverage

The January 26 edition of the *Hartford Courant* contained an article noting that **Radio Collinsville** operates from that CT city on 1620 kHz with a bluegrass music format on Saturdays from 1400-2000 UTC. The station claims to be low power and within FCC regulations, but the newspaper observed that the coverage area of their signal includes at least Collinsville.

❖ New Iranian Clandestine

Via Clandestine Radio Watch #219 and #220, BBCMS is reporting a new Iranian clandestine known as **Clandestine Radio Council**

Democracy. With the current war situation in Iran and Iraq, this one is certainly worth watching. Unfortunately their 7435 kHz schedule between 1700-1800 UTC is certainly inaudible in North America, where the pirate band does not propagate from a Russian transmitter site during local daylight hours. But, you can hear their programming on demand via their web site located at **www.radioshora.org** The shortwave schedule apparently operates on Tuesday, Thursday, Friday, and Sunday. It is being heard in Europe and Asia, but not in the Western Hemisphere.

❖ Radio Pun

An anonymous contributor sent in this story. We missed it for April Fool's Day, normally a significant pirate radio holiday. But, we do have it in time for the forthcoming Memorial Day holiday pirate broadcasts.

Two antennas met on a roof, fell in love and got married. The ceremony wasn't much, but the reception was excellent.

WHAT WE ARE HEARING

Monitoring Times readers heard 31 different pirate radio stations this month. You can hear them, too, if you use some simple techniques. Pirate radio stations never use regularly announced schedules, but shortwave pirate broadcasting increases noticeably on weekends and major holidays. You sometimes have to tune your dial up and down through the pirate radio band to find the stations, but more than 95% of all North American shortwave pirate broadcasts are heard on **6925 kHz**, plus or minus 30 or 40 kHz.

Altered States Radio- This veteran station has been QSLing lately, so their advocacy for drug use does not hinder normal functions. (Merlin)

Ann Hoffer Radio- This pirate exclusively features music by Ann Hoffer. (None)

AYB- This one is only rarely heard. It features a techno rock format, with identifications in Morse code. (None)

Brother Stair Numbers Station- This parody of spy numbers stations cleverly uses Brother Stair's voice to deliver all of the numbers. (None)

Captain Morgan- Twilight Zone television audio, rock music, and comedy are the Captain's regular format. (None, says to send loggings to the Free Radio Network web site)

Grasscutter Radio- Classic rock music is always their format. (Uses *grasscutterradio@yahoo.com* e-mail)

James Bond Radio- Music from James Bond films and "Bond, James Bond" identifications are heard on this one. (None)

KBC Radio- Tom de Wit's quasi-Europirate has created occasional excitement with some high powered 100 kW relays of their programs from Sitkunai, Lithuania on 6255 kHz around 2200 UTC. As we see here this

month they have a nice QSL. Check out their web site at **www.kbcradio.eu/** (Ede and uses *kbc@planet.nl* e-mail)

KI- This new one identified only in Morse code. It featured a male announcer singing pirate tunes over recorded guitars. (None)

KIPM- Alan Maxwell's "Illuminati" existential dramas are still audible despite hints that the programs are out of production. (None known; Elkhorn invalid)

Kracker Radio- They have returned with strange programming featuring obscure new age music. (None)

MAC Shortwave- Paul Star shows up on many frequencies such as 3275, 6850, and 6925 kHz with his professionally produced replica of the old top 40 radio format. (Uses *macshortwave@yahoo.com* e-mail)

Mystery Radio- Andy Walker's rock music Europirate was widely heard during the winter in North America on 6220 kHz just prior to local sunset. (Uses *radio6220@hotmail.com* and *mysteryradio@hotmail.com* e-mail)

Punxsutawney Radio- Among the holiday special pirates is this one from Groundhog Day. This year they showed up on 3275 kHz to see their shadow. (None)

Radio Ice Cream- The Ice Cream Man hosts a heavy metal format that is spiced with children eating ice cream and candy. (Belfast)

Radio New York International- Some pirate broadcast a taped relay of old programming from Alan Weiner's classic shipboard pirate from decades ago, prior to **WBCQ**. (None)

Radio Odyssey- This Greek pirate created some excitement during the late winter with some broadcasts from Greece on 6310 kHz that were heard in North America. (Uses *odyssey.greece@yahoo.gr* e-mail)

Radio Piraña Internacional- This South American pirate created some excitement with almost regular broadcasts using 20 watts on variable 6307 kHz during the late winter. Check out their web site at **www.geocities.com/radio_piranha/** for station news. (Santiago)

Random Radio- Their eclectic format varies randomly from show to show. Recent sign-ons were in various languages, with the main show announced as their English language service. (None; asks for reports via the FRN web site)

Special Ed Radio- This new rock music station plays T Rex, other rock groups, and rock parodies. (None known yet)

Sunshine Radio- This one is one of the few female announcers active in pirate radio today. (Uses *sunshineradio@yahoo.com* e-mail)

The Crystal Ship- The "Voice of the Blue States Republic," transmits on randomly selected frequencies including

Searching for an Island, with a Mountain, with a Lighthouse

Okay, you've accomplished the "Big Three," Worked All States (WAS), Worked All Continents (WAC), and joined the DX Century Club (DXCC). Now what?!

Well, in addition to chasing down the 5-band versions of the above awards (or regrabbing them with the low power QRP or other endorsement), there are quite a few other fun ways to put your operating skills to the test and fill your log with some interesting contacts as well. Let's spend a little time this month looking over some of the other challenges ham radio has to offer.

❖ ISLANDS ON THE AIR (IOTA)

This award program was started in 1964 by a shortwave listener named Geoff Watts. Managed by the Radio Society of Great Britain (RGSB) since 1985, the IOTA program is a great challenge for any ham. The goal of the IOTA program is to encourage hams to contact (and to operate from) the world's island locations. The IOTA committee has established a list of 1200 qualified islands (or island groups) that can be contacted for credit toward a number of awards.

There are some basic rules as to what qualifies as an island. Usually, they have to be in the ocean, not a river or lake, and they have to measure at least 1 kilometer in length. Island locations are given unique numbers associated with the nearest continent. For example, NA-111 indicates the island group off the coast of New Jersey, EU-116 would indicate the Isle of Man, and SA-004 indicates the Galapagos Islands. Qualified islands are listed in the official *IOTA Directory*, a book available from The Radio Society of Great Britain **www.rsgb.org/** or through The American Radio Relay League **www.arrl.org/** The price in the U.S. is $19.95 plus shipping and handling.

IOTA operations can show up anywhere on the ham bands, but the main meeting place for IOTA enthusiasts is 14.260 MHz. Other SSB frequencies include 28.560, 28.460, 24.950, 21.260, 18.128, 7.055 and 3.755MHz. CW frequencies are 28.040, 24.920, 21.040, 18.098, 14.040, 10.115 and 3.530 MHz. So if you want to give this aspect of the ham radio hobby a try, you may want to keep one ear on these frequencies.

There is an annual IOTA Contest sponsored by the RSGB. It is usually held on the last weekend of July. If you live near the coastline, you may consider going portable and offering your own local island to the effort.

For more detailed information on the IOTA project check out the main web site at **www.rsgbiota.org/** Also, a listing of the current IOTA islands can be found at the web site **www.logiciel.co.uk/iota/shtlist.html**

❖ SUMMITS ON THE AIR (SOTA)

Okay, so why should the beach bums have all the fun? There is another award program with similar goals but decidedly dissimilar locations (unless perhaps you are talking about Oahu). The UK based SOTA group encourages folks to set up portable amateur radio stations on the summits of hills and mountains, activating them for hams and shortwave listeners around the world.

Similar to IOTA in many ways, SOTA uses a system of identifying numbers for logging the locations that qualify for awards. The general rule for a qualifying summit is a location that is minimally 150 meters above the surrounding terrain. A further twist is added by points being awarded based upon any summit's height above sea level. Awards are offered in increments of points from 100 through 5000. There are also awards for activating locations (the Mountain Goat Trophy) and for signal "chasers" (the Shack Sloth Trophy).

The SOTA differs from the IOTA program in that it does not currently have standardized calling or operating frequencies. Also, the SOTA program is still not up and running in all parts of the world, but since its inception in 2002, it has been growing by leaps and bounds. Most recently, the 2nd callsign region of the United States joined in the fun. Its current activity centers on the more vertical places in the State of New York, but I expect to see further involvement in a wider area in the near future.

For more general information and complete rules for the SOTA program, go to the Web site **www.sota.org.uk/** For more information on the United States 2nd region offerings, look for the Web site **www.kc2eus.org/sota/**

I think I am going to talk to some other hams in my Outdoor Club and see what we can do to get a few high places on the air from the Northern part of New Jersey.

❖ LIGHTHOUSES

Well now, we must come down from the mountains and head back toward the shore line for this next operating activity. While lighthouses have largely gone out of use in favor of modern navigation systems, they remain historic landmarks worth preserving and remembering. The Amateur Radio Light House Society enjoys the beauty and history of lighthouses and lightships in a special way. The Society seeks to promote public awareness of both ham radio and lighthouses, preserving lights that are in danger of extinction, and paying tribute to the role that hams and lighthouse keepers have played in contributing to maritime safety. The Society offers a number of awards, but requires membership to participate in the awards program. Initial membership is $25 and then $20 each year following.
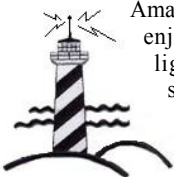
Members of the society are encouraged to "activate" identified lighthouses for the benefit of other hams. Since it is not always possible to have an operating position actually within the lighthouse or lightship itself, the club operates on the basis of a "Visual Sight Rule," whereby you are able to set up shop as long as you can see the light from your operating position.

The Society maintains an exhaustive list of the world's lighthouses and lightships, currently numbering 14,831 in 226 call areas. Quite a challenge for any ham!

The Society sponsors four operating events annually. The Spring Lites QSO Party, generally held in April, the National Lighthouse-Lightship Weekend QSO Party in early August, the International Lighthouse-Lightship Weekend, held the third weekend in August, and the Lighthouse Christmas Lights QSO Party in December. They also hold an annual convention, usually at a location near a well known lighthouse.

Like IOTA, the club has a series of suggested operating frequencies. The SSB frequencies include 1.970, 3.970, 7.270, 14.270, 18.145, 21.370 and 28.370 MHz. The CW frequencies include 1.830, 3.530, 7.030, 10.130, 14.030, 18.070, 21.030 and 28.030 MHz.

For more information about the Amateur Radio Lighthouse Society and its award program, visit its Web site at **http://arlhs.com/**

Another Lighthouse Event

Not formally related to the Amateur Radio Lighthouse Society, the International Lighthouse/Lightship Weekend is held every August, activating dozens of Lighthouses and Lightships world wide. This year's event will be held 0001 UTC August 18th to 2359 UTC August19th, so mark your calendars now. The Web site for this operating event is at **http://illw.net/**

❖ COUNTY HUNTING

While we are looking at cumulative operating awards, we can't forget the old standby for many hams, County Hunting.

The goal of County Hunting is simple enough: making two way contacts with hams in every county in the United States. How hard can that be? Well, there is the fact that there are 3,077 counties in the United States. Oh, and not all of

them have hams living in them. County hunting is a true ham radio challenge. It usually involves contacting mobile stations who have gone on the road to operate from inactive counties for the coveted USA-CA award. Fewer than 1,500 hams have achieved this goal, but some of those have actually done it multiple times.

Any contact you make can qualify toward the various County Hunting awards. This is why it is good to include your county of origin on your QSL cards and ask for the same from other hams. But the majority of County Hunters make use of the County Hunting Nets operating on 14.336 MHz SSB, 14.056.5 MHz CW and 10.122.5 MHz CW. These are controlled nets, so before you jump in with your call, give a good long listen to get the hang of how things operate.

The USA-CA (Worked All Counties) Award is administered through *CQ Magazine* at **www. cq-amateur-radio.com/usacarul.html** but many other award opportunities for County Hunters are administered though the Mobile Amateur Radio Awards Club (MARAC). Their Website is located at **http://marac.org/**

County Hunting is an enjoyable operating activity in that it can be done almost any time of the day. The nets run fairly constantly, sometimes QSYing to 40 meters when conditions warrant. So it is easy to fit things into a busy personal schedule. Counties can be chased with a fairly modest home station. The main requirement for a successful County Hunter is perseverance. If you get on the air often enough over enough time, you will find the counties you need to achieve your goals.

All of the operating activities listed in this month's column have greater emphasis on fun than on competition. That is probably the reason I enjoy them so much.

❖ HAM RADIO WEB SITE OF THE MONTH

This month's Ham Radio Web site is all about tubes:

I have made my way through the ham radio world for years with a short bookshelf full of well worn tube manuals, most dating from well back in the 1960s. Most of these books are not only beginning to show their age, they are flat-out falling apart at this point. That is why I was overjoyed to find the website **www.tubedata.org/**

Started by Frank Philipse of The Netherlands, the site provides essential information on the majority of tubes produced throughout the world. In addition to scans of data sheets (in Adobe .pdf format) for most tubes, the site has loads of additional information on tube bases and tube number systems. One of the most useful sections of the site, for me, has been the American to Foreign tube substitution lists. I run across quite a few old German and British receivers and figuring out what common Yankee tubes will fit their sockets is a great help for restoration projects. This is a link you will want to add to your favorites.

❖ HAM RADIO BOOK OF THE MONTH

Power Supply Handbook
by John Fielding ZS5JF
274 pages

$29.95 plus shipping and handling
Published jointly by
The American Radio Relay League
225 Main Street
Newington, CT 06111-1494
www.arrl.org/
1-888-277-5289
and the Radio Society of Great Britain (RSGB)
www.rsgb.org/
ISBN: 1-905086-21-0
ARRL Order No. 9977

This month's book is all about power:

Over the years, I have discovered that the most common failure with most equipment in my shack has been in the power supply. So any resource that helps a radio hobbyist understand the workings of the power chain in a transmitter, receiver, or any other gear is worth having around. John Fielding is an electrical engineer and a licensed amateur radio operator for 35 years. He brings his years of skill and experience to hams everywhere through this excellent book.

The book begins with a study of power supply basics, the difference between regulated versus unregulated power supplies as well as design parameters. It then details all the components that can go into a power supply design and how to decide which parts will work best in any particular application. John goes on to show how to build power supply systems from scratch and also how to modify existing power circuits for improved performance.

Also covered is how to go about correctly testing and measuring a power supply's performance and output. Fielding also covers battery backup power systems, so important in making sure your station is ready to go in any emergency. If you want to fully understand most equipment's "weakest link" or if you just enjoy learning about the inner workings of electronic equipment, this book is well written for the average ham.

I suppose I should try to find a nice island with a lighthouse on top of its highest hill. I could set up a station that would provide a triple opportunity for hams around the world.

Have fun. I'll see you on the bottom end of 40 meters.

UNCLE SKIP'S CONTEST CALENDAR

MARAC County Hunter Contest (CW)
May 5 0000 UTC - May 6 2400 UTC

10-10 Int. Spring Contest (CW)
May 5 0001 UTC - May 6 2400 UTC

Indiana QSO Party
May 5 1600 UTC - May 6 0400 UTC

New England QSO Party
May 65 2000 UTC - May 6 0500 UTC
May 6 1300 - 2400 UTC

FISTS Spring Sprint
May 12 1700 UTC - 2100 UTC

CQ WW WPX Contest (CW)
May 26 0000 UTC - May 27 2359 UTC

1710, 3320, 3346, 3275, 6875, 6925, and 9057 for The Poet's rock music and leftist political commentary. (Belfast and uses *tcsshortwave@yahoo.com* e-mail)

Undercover Radio- Dr. Benway's rock music and adventure programming "from the middle of no-where" QSL is regularly generating QSLs. (Uses *undercoverradio@gmail.com* e-mail)

Wal Mart Radio- This new one materialized right after Punxsutawney Radio on 3275 kHz with a classic rock music format. (None announced)

WBNY- Commander Bunny, the voice of the rodent revolution, still transmits both digital SSTV mode broadcasts and regular audio transmissions that often involve monkeys. (Belfast)

WBZO- This rock music pirate also is a malicious parody of a certain DXer. (None)

WPDR- This new one, with a slogan of "President's Day Radio," appeared on that USA holiday with programming consisting entirely of speeches by several USA Presidents. (None; said like the Presidents they do not deliver)

WNKR- This rock music station may be a pirate production or a relay of programming generated elsewhere. (None)

WPMR- Here's another new one, using a slogan of Wasabi Pea Man Radio. They feature middle eastern music and pirate radio commentary. (Belfast)

WTCR- "Twentieth Century Radio" programs rock music. (None)

WTPR- Tire Pressure Radio still claims that if DXers listen to "Tire Pressure Radio" broadcasts, all of the air will escape from the tires on their car. (Now using Belfast)

❖ QSLing Pirates

Reception reports to pirate stations require three first class stamps for USA maildrops or $2 US to foreign locations. The cash defrays postage for mail forwarding and a souvenir QSL to your mailbox. Letters go to these addresses, identified above in parentheses: PO Box 1, Belfast, NY 14895; PO Box 109, Blue Ridge Summit, PA 17214; PO Box 146, Stoneham, MA 02180; Casilla 159, Santiago 14, Chile; Argonstraat 6, 6718-WT Ede, Holland, and PO Box 293, Merlin, Ontario N0P 1W0. Unfortunately, PO Box 69, Elkhorn, NE 68022 is no longer a valid address, although a few pirates announce it.

Some pirates prefer e-mail, bulletin logs or internet web site reports. The best bulletin for submitting your pirate loggings is the e-mailed Free Radio Weekly newsletter, free to contributors via *yukon@tm. net*. A few pirates will sometimes QSL reports left on the outstanding Free Radio Network web site, at **http://www.frn.net**

❖ Thanks

A Pedestrian-Mobile Antenna

Generally, the higher and more in the clear a handheld scanner or transceiver's antenna is mounted, the better that antenna performs. Performance is also improved if we connect a quarter-wavelength radial wire to the grounded portion of the handheld's antenna connector.

The project described below raises your antenna by placing your antenna's vertical element above your head (fig. 1A), clear of you and of other persons nearby. As a plus, it adds radials to the antenna. Thus, this antenna gives significantly better performance than simply using a rubber duck connected to your handheld in the usual way. You can design this antenna for frequencies of your choice.

If you've been to a busy hamfest, you have probably seen one of these hats. The antenna is mounted atop a hard hat such as that used by construction workers to protect their heads. From inside the top of the hat, a thin, 4 ft length of coaxial cable runs down to your handheld. The handheld can be on your belt, in your pocket, in your hand, or wherever you wish to put it.

❖ Let's Make One:

Unsnap and remove the headband while working on the hat. For the antenna socket, center a 1/2 inch hole in the hat's top. It's best to drill first with a small bit and gradually work up to a full 1/2-in bit. After that, using a small, hand-held grinder tool with a very small router bit, I reduced the thickness of the material around the hole. Otherwise, the material was too thick to screw on the connector nut when the radial wires were placed under the washer.

Making this hole and reducing the material's thickness could probably be done with other tools, such as a hot wood-burning pen or hot soldering iron, though you may have to clean and sand them off later! (Once the hole is made, the hat of course no longer qualifies as an OSHA-certified hard hat.)

The RG-174 coax (fig. 1B) used here is both thinner and more pliable than larger-diameter coax, making it easy to manipulate. Any feedline causes some signal loss: the shorter the line, the less the loss. The 4-ft length used here produces less than 1 dB signal loss: an essentially negligible amount.

The hat end of the feedline uses a through-the-panel, female, BNC socket: The kind that totally encloses the end of the coax (fig. 1B) is best here. The cable end which attaches to the handheld uses a male, BNC plug, somewhat like that on your rubber duck antenna (fig. 1B). Put the line through the hole in the hat before attaching your second connector. Also remember to put the nut and washer on the female end of the line before you connect the second connector.

❖ Radials:

I tried pruning the radials for resonance with an SWR meter; however, using radials cut to the length given by the formula below worked best. I used size-18, bare hook-up wire, but size is not critical here.

Using just two radials, both cut for 147 MHz, with no radials for the 70 cm band, produced results as good as when 70 cm radials were added. If the two bands you use are not related in an approximate 3-to-1 frequency ratio, then omitting radials for the higher-frequency band may not work as well for you. You can try both ways and check it out.

Two radials for the same band can be made as one continuous length of wire that is twice the length of one radial. The midpoint of such a wire is slipped beneath the washer of the female coax fitting, and the nut then tightened. The two halves of the wire then extending from the fitting will be proper-length radials.

Once the center of the wire is clamped under the connector's washer, the radials then extending from the connector are taped or glued inside the hat. The radials are positioned against the inner side of the hat straight down to near the bottom brim area. Then bend them at a right angle and run them near the brim as in figures 1C and 1D. Space the radials evenly apart and don't allow them to touch each other.

My hard-hat antenna was designed to operate on both the 2-meter (144-148 MHz) and the 70 cm (420 to 450 MHz) ham bands. You may want your hat antenna to function on other frequencies. The length of one individual radial (remember this is just half the length you cut as described above) or the length of a full, quarter-wavelength vertical element can be found by: Length (in inches) = 2808/(frequency in MHz), or Length(in cm) = 7130/(frequency in MHz). Cut the elements for the middle of the bands you choose. Each radial for 147 MHz was 2808/147 = 19.1 in long, and the telescoping, vertical, quarter-wavelength element mentioned below was that same length.

Covering the hat with tinfoil as a ground plane was significantly less effective than using radials.
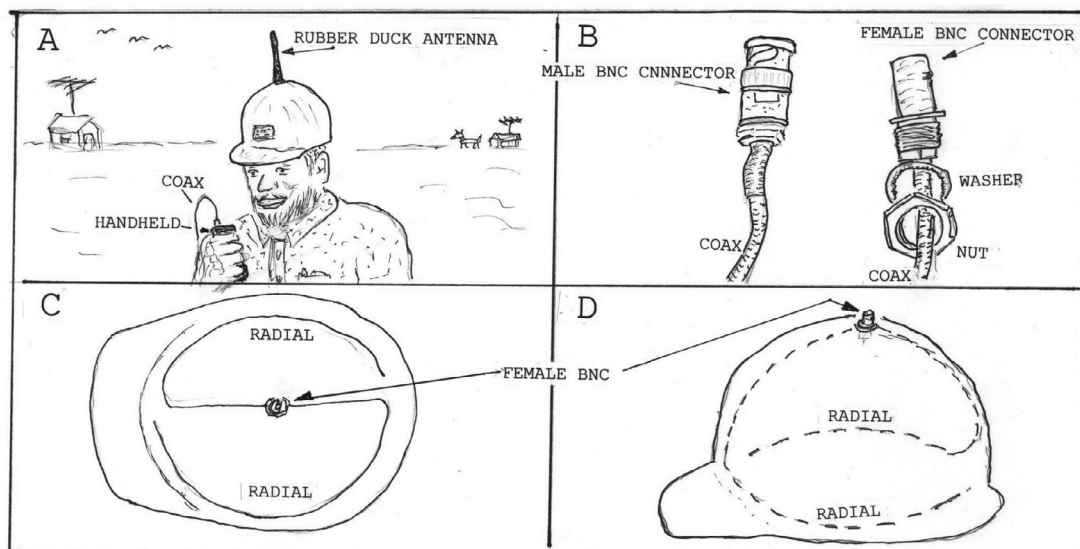
Fig. 1. A hard-hat antenna (A), connectors for the hard-hat antenna feedline (B), bottom view of the hat with two radials (C), X-ray, side-view of the hat with radials.

❖ Some Comments:

A stubby duck antenna (shorter than a rubber duck) should work well as the vertical antenna element where signals are moderately strong. Using a full-sized, quarter-wavelength, vertical, telescoping element on 2-meters increased the effectiveness of the hat antenna significantly over an ordinary rubber duck and should help if signals are weak. Surprisingly, the quarter wave didn't feel too unwieldy on my head when in use, but it will knock the hat from your head if you forget to duck low for doorways!

I don't have a 70-cm band rubber duck at present, so I couldn't make the same comparison for that band. If I had, it would probably have shown the same advantage for the full quarter wave element over a rubber duck on that band, too. The full quarter-wavelength on 70 cm is only 6.4 in long.

RADIO RIDDLES

Last Month:

I asked: "What is a 'magnetic antenna?' For that matter, what is an 'electric antenna?'"

Well, there are two kinds of magnetic antennas. One kind of magnetic antenna is a small vertical antenna with a magnet to hold it in place atop a vehicle. It's called "magnetic" because of its magnetic base.

Another kind of magnetic antenna is one that responds primarily to the magnetic field of an electromagnetic (radio) wave. Small loop antennas and slot antennas are examples of magnetic antennas.

There are also two kinds of electric antennas. One is the automobile-radio antenna that has an electric motor that raises it when the ignition is turned on and retracts it when the ignition is turned off. It's called "electric" because it raises and lowers via an electric motor.

The other kind of electric antennas are those that respond primarily to the electric field of an electromagnetic wave. Wire antennas such as dipoles and groundplane antennas are examples of electric antennas. Incidentally, slot antennas are the magnetic-antenna analogs of electric dipole antennas.

This Month:

So we know about a hat that wears an antenna. But does an antenna ever wear a hat?

You'll find an answer to this month's riddle, another riddle, another antenna-related web site or so, and much more, in next month's issue of *Monitoring Times*. 'Til then Peace, DX, and 73.

❖ Sources for Parts:

www.dxing.info/equipment/rg_174_ coax_bryant.dx has info on RG-174, including attaching the coax connectors. That site also has links to suppliers of connectors for RG-174. Sources of RG-174 coax include:
www.radiobooks.com/products/rg174. htm, and,
www.allelectronics.com/cgi-bin/item/RG- 174/825/RG-174_MINI_CO-AXIAL_CA- BLE_.html

This next site had RG-174 at writing time:
www.danssmallpartsandkits.net/

Introducing the BC-348

B ack in October 2001 (Wow! Was it really that long ago?) we launched the first of what became a very popular group of articles on the World War II aircraft "command set" receivers. Paired with the transmitters that were also part of the system (designated SCR274-N by the Army and ARC-5 by the Navy), the command sets were intended for plane-to-plane communication within formations and were installed in both our fighter planes and our bombers. Beautiful in their ugliness, these amazingly compact little sets were available by the thousands in the surplus market after the war and became the basis for many a beginning ham station.

But besides interplane communications, our long-range aircraft, such as bombers, also needed facilities for communicating back to base. And for this, more sophisticated equipment was required. The receiver that evolved for this application was the BC-348, a set that was designed to be operated by a specialized radio-man rather than a fighter pilot. Like the command sets, the BC-348 was also available in large numbers after the war and was eagerly snapped up at bargain prices by the amateur radio community.

Unlike the single-band 6-tube command receivers, the much larger 8-tube BC-348 was a multiband set and had more advanced features such as a crystal filter, a.v.c. control and adjustable bfo. Like the command equipment, the '348 was powered by a built-in dynamotor that operated from the plane's 24 v.d.c. electrical system.

While the spare simplicity of the command sets gives them a lot of physical charm, the BC-348s are (at least to my eyes) just plain ungainly. But what these radios lack in appearance, they make up for in historical significance. These are the radios that were installed in the B-17s and B-29s, piloted by our intrepid young air crews,

At the controls of a BC-348 in a B-17 radio cubicle. Floyd Jury, shown here some 65 years ago, has been a radio enthusiast since grade school and is an active member of The Antique Wireless Association. Courtesy AWA.

as they droned over Europe laying waste to Axis manufacturing plants and bases.

❖ Some BC-348 History

Different models of the BC-348 are designated by different letter suffixes. One list I have seen shows at least 20 of them. Some letters indicate only minor electrical or physical differences; others may refer only to the set's manufacturer or a specific contract.

Here's what I've been able to piece together. The historical background comes from Bill Fizette's "The Communication Receiver" column in the August 1986 issue of *The Old Timer's Bulletin (*Now *The AWA Journal,* for which I have the pleasure of serving as Editor). In the article, Bill quoted at length from an interview he conducted with H.A. Robinson, the BC-348's original design engineer. (By the way, Bill still writes "The "Communication Receiver" for our publication.)

BC348 front view–see text. Courtesy AWA.

At any rate, the BC-348 started life in the early 1930s as the BC-224, which operated from a 12-14 volt aircraft electrical system. The first major production run (the BC-224-A – manufactured by RCA) was in 1936-1937. In 1938, specifications were released for a substantially improved BC-224, and this, too, was manufactured by RCA (as the BC-224-B).

With the changeover to 24-28 volt electrical systems in military aircraft, the BC-224-B had to be redesigned. I imagine that the voltage change was necessitated by the increased power demand aboard the aircraft. This was the same reason automobile electrical systems changed over from six to 12 volts in the late 1950s. It meant that power could be transferred at lower currents, and therefore over smaller gauge wires.

The change gave rise to the BC-348-B, which was identical to the BC-224-B except for the different dynamotor and the different tube heater wiring necessitated by the higher-voltage

power supply. The BC-224-C and -D and the BC-348-C (apparently there was no -D) seem to be identical with the -B models of each set – the only difference being in production run contract.

However, an important change took place with the -E models of both radios. Long-range military aircraft were beginning to make extended flights over water, and there was a need for a low frequency band for communication with ships. Accordingly, beginning with the BC-224-E and BC-348-E, the 1.5 - 18 MHz frequency range formerly covered in six bands was compressed into five – freeing a switch position for a new 200-500 kHz band.

❖ Alphabet Soup

At this point, the letter suffixes became associated not so much with physical changes as with different contracts with different manufacturers. Because of growing wartime needs, RCA was no longer the only manufacturer of these radios. Stromberg Carlson, Belmont Radio and Wells-Gardner all became suppliers. The military maintenance manuals for these receivers are very helpful in identifying letter suffixes that refer to identical, or virtually identical, sets.

For instance the manual for the BC-348-E and BC-224-E also covers the BC-348-M, -O, -P and -S as well as the BC-224-G, -H, and -L. And it specifically states that the sets are – for all intents and purposes – identical (except, of course, for their voltage requirements, as described earlier. Let's call these sets group 1.
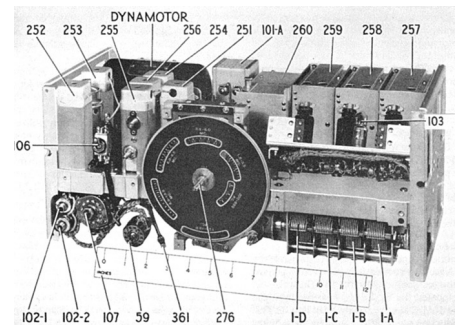
Inside the BC-348–see text. Courtesy AWA.

Another group of virtually identical sets (group 2) is the BC-348-H, -K, -L, and -R as well as the BC-224-F and -K. Group 2 seems to differ from group 1 only in that its audio output tube is an octal-base 6K6GT instead of a tall glass, 6-pin 41. According to Robinson, the

shorter "GT" style tube, which would certainly have been preferable to the tall glass ("ST" style) type in a combat radio, was simply not available at the time of the earlier design.

Group 3, including BC-348-J, -N and -Q (no BC-224 versions), does differ markedly from the first two. Though the external appearance is identical, the design is revised and simplified – using single-ended equivalents of the top-cap types found in the former groups. (In a single-ended tube, all of the connections are made at the bottom of the socket.) In addition, this group uses a combined oscillator/mixer tube (6SA7 pentagrid converter) instead of the separate oscillator and mixer tubes in the earlier groups. All in all, the tube types used are more like those found in a home entertainment receiver of the era. There are also physical differences in the arrangement of the i.f. strips.

❖ Features of the BC-348 and BC-224

All sets have two stages of r.f. and three stages of i.f. with tube complements as shown in Table 1. Table 2 shows the frequency ranges for the various bandswitch positions in sets with and without the low-frequency band.

The receiver's few simple controls can be clearly seen in the front illustration (from the Bill Fizette article previously mentioned). At the upper right center is a dial light control that would be used, I presume, for dimming under combat conditions. The binding posts at lower right are for the antenna and ground. Just above them is the antenna adjust trimmer. The bandswitch is the star-shaped control just below the tuning dial. A rotating mask in the dial turns with the bandswitch, positioning a window that exposes only the band in use.

Below and to the right is the tuning knob, which is equipped with a convenient spinner. One of the features of these receivers is the very fine and precise geared-down tuning. But without the spinner, it would take quite a while to get from one end of a band to the other. The knob to the left of, and slightly below, the tuning knob is the BFO (beat frequency oscillator) adjust control. It controls the tone of the signals heard during Morse operation.

Proceeding to the left of the BFO control, you'll see the volume control, the bat-handle switch selecting manual or automatic volume control (MVC or AVC) operation and a couple of phone jacks. As it stands, this radio does not have enough gain for speaker operation, nor is it equipped to match a standard low-impedance speaker. Of course, it wasn't unusual for hams who acquired these sets as surplus after the war to add an extra audio stage and proper audio transformer to drive a speaker at their stations.

Above the MVC-AVC switch is the switch for turning the BFO on and off, and to the right of that is a switch for cutting the crystal filter in and out. You may be wondering about the wide, screwed-on plate below the pilot light dimmer. It's there to provide access to the otherwise-inaccessible underside of the r.f. deck for troubleshooting and servicing.

I've included a shot of the set minus its cabinet (also from the Bill Fizette article) to give you an idea of the interior construction. To my eyes, at least, this radio is a lot prettier on the inside than on the outside. Now you can see how the masks for the tuning dial are staggered, so that they reveal only one specific band

The BC-348 provided reliable base communications for long-range bombers such as the B-17 (shown) and B-29.

when in the upright position. The black dynamotor is visible at the left rear, and the i.f. transformers (which can be individually unplugged for servicing) are on the deck in front of it.

The r.f. deck is located at the top right of the chassis, with the four-gang tuning capacitor below it. The coil enclosures are directly behind the deck. Notice the square can (labeled 101A) at the center rear of the chassis. This is the audio output transformer. By moving a tap on it, one can change the output to match either 4000- or 300-ohm headphones.

This concludes our introductory tour of the BC-348. Next time we'll take a good look at the unit that's in the shop awaiting restoration and see what problems we might be facing. It should be interesting!

TABLE 1				
TUBE COMPLEMENTS–BC-224 AND BC-348				
	BC-224-A	**Group 1**	**Group 2**	**Group 3**
		(See Text for the BC-348/224 models in each group)		
1RF	6D6	6K7	6K7	6SK7
2RF	6D6	6K7	6K7	6SK7
OSC	76	6C5	6C5	–
MIXER	6D6	6J7	6J7	–
OSC/MIX	–	–	–	6SA7
1IF	6D6	6K7	6K7	6SK7
2IF	–	–	–	6SK7
2IF/CW OSC	6F7	6F7	6F7	–
3IF/DET/AVC	6B7	6B8	6B8	–
3 IF	–	–	–	6SJ7
DET/AVC/CW OSC	–	–	–	6SR7
OUTPUT	41	41	6K6GT	6K6GT
VOLTAGE REG	–	991	991	–

TABLE 2						
FREQUENCY RANGES (IN MHz) BY BANDSWITCH POSITION						
	1	2	3	4	5	6
EARLY SETS	1.5-3.0	3.0-5.0	5.0-7.5	7.5-10.5	10.5-14	14.0-18.0
"E" SUFFIX AND LATER	0.2-0.5	1.5-3.5	3.5-6.0	6.0-9.5	9.5-13.5	13.5-18.0

Comparing Four Mid-Priced Portables:
Grundig G4000A, Kaito 1103, Grundig G5, and Sony ICF-SW7600GR

By Todd Van Gelder

I'm tough on my shortwave portables. I expose them to travel, the tropical conditions of a hot and humid bathroom during showers, and occasional freezing conditions, when I venture outside on winter nights to hunt longwave beacons and elusive shortwave signals away from the wrath of the RF interference that pervades my Maryland neighborhood.

Since I rediscovered my love of shortwave listening and DXing several years ago, I've acquired a small collection of affordable radios. My initial purchase conditions were simple: digital readout and SSB reception. Now this may not seem like a lot to ask for, but as anyone who was an SWL during the 1970s or before (as I was) can tell you, these features were a mere fantasy then. So, when I picked up the hobby again, I purchased a Grundig Yacht Boy 400PE. It seemed amazing to me that for around one hundred and forty dollars, one could purchase a compact, full featured radio that covered longwave to shortwave and had great FM reception as well. More importantly, as an occasional utility listener, I could actually make out what was being said on side-band and stations didn't drift!

However, after several years of daily use, sometimes under harsh conditions, the YB 400PE started to have some minor problems. Most of these issues were due to the fact that I traveled quite a bit with it. So, it was time to pick up a radio just for travel. Around that time, I started to read some good things about the newly introduced Kaito 1103. The feature-set seemed incredible for any radio under two hundred dollars. The fact that it was around ninety dollars made it a downright bargain, so I ordered one.

The Grundig G-5 and Sony ICF-SW7600GR were more recent acquisitions. My reasons for picking up these additional radios will be mentioned later in this article.

❖ It's what's on the outside that counts

The old adage, "It's what's on the inside that counts," is generally used when talking about people. But when talking about shortwave reception, it's what's on the *outside* that counts: your antenna. When taking these radios through their paces, I tested reception three ways: with the attached whip antennas, the internal AM antennas and with my outdoor longwire antenna.

I've had two outdoor setups in the last eight years. The first was a 75 foot, end-fed wire, which was in a horizontal V-shape. It provided excellent reception, although it picked up its fair share of noise, since we lived on a main road with nearly half a dozen power lines running right past our house. This past summer, our family moved a few doors down, which took us off the main road, so the noise levels are somewhat lower. However, since we live in a historic village, I was faced with the challenge of keeping my new antenna setup discreet (as I had at the old house).

I had known that the previous owner of our new house had installed an electric "border" fence for his dog. This gave me a great idea. I knew that there was well over two hundred feet of heavy gauge copper wire buried throughout our new property. I also noticed that at least 60 feet of this wire ran across the rafters of our detached garage. Since the previous owner had taken the electronics off of the system in order to set up

an electric fence at his new house, I thought that tapping into the existing copper wire fencing at a point closest to our house might make for a good shortwave antenna and would insure that I had no visible antennas outside of the house.

Though I understood that, theoretically, a buried shortwave antenna is not ideal, I threw caution to the wind. I snipped the heavy copper wire where it ran next to the house in a planting bed and ran a length of coax out the side of the house. I connected the center lead to both stripped wires and sealed it up with a large wire-nut. Strange though it may be, the antenna performs quite well and provides that extra boost needed when a whip antenna just won't do the trick. During the evaluations that follow, this was the primary antenna used.

❖ The Grundig YB400PE –
A Full Featured Workhorse

Why mess with success? The YB 400PE is likely the most popular shortwave portable in recent history. So instead of dropping the model, Grundig simply renamed it the Grundig G4000A. I've been using this radio for over 5 years on almost a daily basis and it has performed well. I wish I could say "without a hitch," but that would not be true. On several occasions over the years, the radio has lost all of the 40 pre-set frequencies that I've entered into its memory and each time, for no apparent reason. After this happened the first time, I built a spreadsheet which listed all of the frequencies, along with country or station data. This way, I'd have a paper and electronic record to back my choices up in the event this happened again.

The Grundig G4000A, Sony ICF-SWS7600GR, Kaito 1103 (Photo by Eric Van Gelder)

Just as I finished entering the 40 frequencies into the spreadsheet, it *did* happen again! Fortunately, this radio shines compared to the other three in the area of intuitive operation when it comes to station memory entry, so re-entering the frequencies wasn't that much of a chore. You simply enter the frequency, choose a pre-set number, and away you go. Entering presets into the other radios is more complex.

However, one of the drawbacks of this Grundig model compared to the other radios is that it *only has* 40 station presets. The Sony has 100, the Kaito has 268, and the Grundig G5 has a whopping *700*. Another minus is overall frequency coverage. Where the other three radios cover almost all of the broadcast and utility spectrum from longwave (LW) through commercial FM (US) and then some, the G4000A has a frequency gap between 353 and 500 kHz. I've found there are enough beacons (including the one at our local small airport) and other interesting signals in that range, that I missed having continuous coverage.

On the other hand, this radio has great sensitivity on LW. The proof was that on a trip to the Caribbean, I could actually pick up numerous European broadcasters with it! In fact, the overall sensitivity of the G4000A is excellent. There seems to be little difference in what signals it can pull in from the bottom to the top end of the shortwave frequency spectrum. It is also sensitive enough to pick up several Cuban broadcasters on AM, like Radio Reloj on 870 AM, with just a slight turn of the radio. For AM reception, the G4000A uses the internal ferrite bar antenna. The external antenna connection only works for shortwave and FM, not AM or LW.

One of the biggest differences between these four radios is the tuning method. This model can be tuned using direct frequency entry, or by using one of the up or down buttons on the front panel in steps of one, five and ten kHz (in the case of FM).

As all of these radios are portable, battery consumption is an issue. The G4000A is average in this department. It will use up a new set of alkaline batteries after around two weeks of daily use of approximately an hour a day. However, an excellent power adapter is included. It puts out very little of the noise that is typically associated with "wall warts" of this kind.

One other nice accessory is the wind-up antenna (included). I've used this while traveling not only with the G4000A, but with the other radios mentioned in this article.

Since I use the G4000A as my daily alarm clock as well as a SW receiver, I like the fact that it has settings for two time zones. I have one set to UTC and the other set to our local time. The level of the backlight leaves a bit to be desired.

I noticed after about a year of use, the side-mounted volume control started to give off that "crunchy" sound that is common to old potentiometers. It's usually the sign of a dirty control. I sprayed it with some commonly available CRC electronic contact cleaner. It was fine for a while, but started to happen again about two months later. After several consecutive treatments with that contact cleaner, I tried an alternate: Radio Shack tuner cleaner w/lubricant. Four years after

that treatment, the problem still hasn't returned. So for this particular radio, I'm a believer in that little can from RS!

In comparison to the other radios here, it's worth mentioning that the G4000A and the Sony 7600GR have the best audio quality when using the built in speaker, with the Grundig getting the slight edge. In terms of quality on SSB, the G4000A is a bit tinny.

FEATURES
o Tunes both upper and lower sideband with infinite fine-tuning.
o User selectable tuning steps: 1kHz/5kHz in SW; 1kHz/9kHz/10kHz in MW; 1kHz/9kHz in LW.
o User selectable wide/narrow bandwidth filter.
o DX/Local switch.
o Hi/Low tone option.
o Switchable 9kHz/10kHz scan rates on MW
o FM-stereo with mono option.
o Telescopic antenna for FM and shortwave reception.
o Built-in ferrite antenna for MW and LW.
o External SW antenna can be connected via the built-in receptacle.
o Shipped with owner's manual, warranty card, operating instructions, carrying case, earphones and AC adaptor for North American use.
o Dimensions: 8"W x 4.8"H x 1.5"D Weight: 1lbs. 5oz.
o Power Source: 6 AA batteries (not included) or AC adaptor (included)
o PLL synthesized tuning for rock-solid frequency stability.
o Continuous shortwave from 1.6 through 30 megahertz, covering all existing shortwave bands, AM and Longwave.
o Single sideband (SSB) circuitry
o 40 randomly programmable memory presets. The memory "FREE" feature automatically shows which memories are unoccupied and ready to program.
o The LCD shows simultaneous display of time, frequency, band, automatic turn-on, and sleep timer.
o Liquid crystal display (LCD) shows time and clock/timer modes.
o Dual alarm modes: beeper & radio.
o Dual clocks show time in 24 hour format.

RATINGS (0-10 scale) Grundig G4000A

Audio Quality	9
Battery Consumption	7
User Interface/Ease of Use	8
Overall Features	6
Overall Reception	7
Longwave Reception	7
Construction/Initial Quality	9
Long Term Quality	6

❖ The Kaito 1103 - Almost too good to be true

When I first started reading the feature list of the Kaito 1103 in an on-line catalog, I kept glancing over at the price to make sure I wasn't imagining things. Here was a full range, full featured digital radio with SSB, 268 pre-set station memory, a tuning *knob*, as well as direct input tuning and two frequency readouts, one fully digital and one that mimicked an analog radio and all for around $90.00! It was as if someone had gone into the subconscious minds of all of us who loved analog radio, but also embraced the digital age and came up with the ideal inexpensive radio. In short, this radio was *cool!*

Even though there was a bit of a learning curve when it came to operating the 1103, it seemed the more I played with this radio, the more I liked it. Because the tuning knob also controls volume and several other functions, it takes a while to get used to. However, there is always another option besides this knob to select or change each feature on the 1103.

The SSB on the 1103 is clear as one could expect for a radio of this price, but better than I expected.

The backlight is strong and steady on both the digital and pseudo-analog readouts and battery consumption is very low. But with the 1103, one need not worry about batteries, as the radio comes with rechargeable batteries built in and the wall adapter also acts as a charger. One charge and the radio would play for over a week of daily use. This is one feature that I really appreciate and miss on the Sony 7600GR and the Grundig G4000A.

In terms of sensitivity, the 1103 is just as sensitive as the G4000A and like all of these dual-conversion radios, there are rarely any frequency ghosts or other signal overload problems associated with single-conversion radios. However, the 1103's sensitivity seems to drop off sharply in the longwave bands. I can easily pick up LW signals with the other three radios that I can barely detect with this one.

One drawback of this radio is that, that like the G4000A, you can't use the external antenna jack for either AM or LW. One night I was trying to tune in the pirate radio station from Brooklyn, NY, "Radio Mosiach and Redemption" on 1710 AM. No dice. However, when I tuned to 1711, my outdoor antenna was activated and there it was! Radio Mosiach is a favorite target for me, as I often visit family in the NY metro area. In fact, the 1103 made for a handy direction finding radio, as I tracked the pirate station to an approximate location near its mailing address, just off Eastern Parkway in Brooklyn one afternoon.

Trouble in Paradise?

About two years into owning the 1103, the multifunction knob used for tuning, volume, and several other functions started to go bad. Via an article in *Monitoring Times*, I had read about the possibility of this happening on some early production runs of both the Kaito and Degen models of this radio. But there was no guarantee that it *would* happen.

The symptoms started gradually; frequencies would zip by faster when using the tuning knob and sound levels would jump sporadically when using the same knob to adjust the volume. I temporarily fixed the problem using the same Radio Shack cleaner/lubricant spray I had used on the G4000A, but the problem would return the next day. Eventually, I had to open the 1103 in order to clean this control more thoroughly, but this solution didn't work, either.

However, by using the push buttons for tuning and volume controls, I still use this radio regularly. It's still a technological marvel to me.

FEATURES:
o 268 memory presets (Dynamic memory on 19 Pages) with autoscan

- o Beeper, radio and sleep clock/alarm
- o Manual or direct-entry frequency tuning
- o Electronic volume set
- o Smart charger with count-down timer and battery power/charge indicator
- o Meter band to frequency conversion
- o 3 backlight modes
- o LCD bar graph signal strength indicator
- o External speaker, earphone, line output and antenna jacks
- o Auto reset prevents deadlocking
- o Extra-long telescoping antenna improves reception
- o DX/LOCAL switch to prevent front-end over-load
- o FM mono/stereo selection
- o Music/news (voice) tone control with "Super bass" selection

RATINGS (0-10 scale) Kaito 1103

Audio Quality	6
Battery Consumption	9
User Interface/Ease of Use	6
Overall Features	9
Overall Reception	7
Longwave Reception	2
Construction/Initial Quality	8
Long Term Quality	5

❖ The Grundig G5 – The New Kid on the Block

The newly introduced Grundig G5 became available in 2006. This model takes the features of the Kaito 1103 a step further. Once the problems started on the 1103, I was tempted to buy another of the same model, but fearing history would repeat itself, made the step up to the G5.

It's no coincidence that the G5 has many of the same features as the Kaito. In fact, the side panel layout is almost identical. This is because Kaito/Degen manufactures the G5 for Grundig. The G5 has excellent sensitivity across the board on SW, AM and FM and is a great performer in the LW band as well. This made me curious as to why Grundig doesn't mention LW even existing on this radio in ads or feature lists (a mystery that has yet to be solved).

In terms of power, the G5 includes an adapter that also acts as a battery charger, but unlike the Kaito 1103, the rechargeable batteries are not included. Another oddity of this charging system is that the radio asks you how many hours you would like the batteries to charge. The Kaito, on the other hand, stops the charging process when the batteries are full.

This radio sports 700 memories, which is an impressive number and one that I'd never likely come even close to fully populating. However, I found that the method for both

entering frequencies into memory and recalling them was tedious and not well thought out. In order to get to any page of memorized frequencies, one has to hold down the tiny button of that page and scroll through the 10 selections. I like intuitive radios and in this regard, the G5 is not.

SSB clarity on the G5 was very similar to the 1103. In fact, in terms of performance, the G5 is like the 1103 in many ways. One area where the G5 stands head and shoulders above the rest, though, is FM reception. I don't know if enhanced FM reception was an intended feature, but it certainly is a welcome one. Just using the built in whip antenna, I could clearly get every station from not only Washington, DC, which is around sixteen miles away, but also Baltimore and its surrounding areas, which is close to 30 miles away.

What was amazing was the selectivity between tightly packed FM stations. This radio seemed to separate them with no problem. Reception had very little of the "fuzz" that is common to distant FM stations. The real test was to try to tune in a weak FM station from Annapolis, Maryland, that I enjoy. The station, WRNR, is not only less than ten-thousand watts, but it is over 50 miles away and beams its signal away from the DC area, to eliminate interference with WAFY from Frederick, Maryland. Although both stations put out similar wattage, typically, because of directional patterns, WAFY wins the battle. Not so with the G5. A quick turn of the antenna to the east, and WRNR came in like a champ.

With the exception of the non-intuitive memory feature, I really like the G5 overall. However, the question that looms large is whether or not the G5's tuning multi-function tuning knob will hold up. Since it has the same genetic makeup (and presumably, comes from the same factory) as the Kaito 1103, I wonder if the same problems with the knob will ultimately occur.

FEATURES:
- o AM, FM-Stereo and Full-Shortwave Coverage (1711-29999 kHz)
- o PLL Dual Conversion AM/SW Circuitry with SSB
- o 700 Programmable Memory Presets
- o FM Station Auto Tuning Storage (ATS)
- o Alpha-Numeric Four Character Memory Bank Labeling
- o Tunes via Auto-Scan, Manual-Scan, Direct Key-in Entry and Tuning Knob
- o Selectable 9/10 kHz AM Tuning Steps
- o Clock, Sleep Timer and Four Programmable Timers (for alarm or wake-up)
- o Weekday Setting
- o World Time-Zone Selection
- o Shortwave Narrow/Wide Bandwidth Selection
- o AM/FM News/Music Tone Selection
- o Stereo Earphone and Line Out Sockets
- o Socket for External Shortwave Antenna
- o Internally Recharges Ni-MH Batteries (batteries not included)
- o Power Source: 4 AA batteries (not included); AC Adapter (included)
- o Dimensions: 6-5/8" W x 4-1/8" H x 1-1/8" D
- o Weight: 12.2 oz
- o Included: Owner's Manual, Protective Case, AC Adapter/Charger and Warranty Card
- o Weight: 12.2 oz

RATINGS (0-10 scale) Grundig G5

Audio Quality	6
Battery Consumption	7
User Interface/Ease of Use	5
Overall Features	9
Overall Reception	8
Longwave Reception	8
Construction/Initial Quality	8
Long Term Quality	NA
Audio Quality	6
Battery Consumption	7
User Interface/Ease of Use	5
Overall Features	9
Overall Reception	8
Longwave Reception	8
Construction/Initial Quality	8
Long Term Quality	NA

❖ The Sony ICF-SW7600GR – A great radio, built to last

When I went to J & R in New York City to buy up the Sony ICF-SW7600GR, the salesman, an older gentleman, said to me as he handed me the radio, "You know, that one is *still* made in *Japan.*" I laughed to myself, as I remembered that as a kid that "Made in Japan," meant "junk." Now, a piece of electronic equipment that's made in Japan and *not* China (as the other three radios are) is considered a rarity. Japanese craftsmanship has become legendary, as it transformed the entire automobile and electronics industries.

In fact, you can feel a real difference when you first pick up the Sony 7600GR. It feels very solid compared to the other three radios. It looks and feels like it's built to last. The buttons and controls seem a bit bigger than even the G4000A. In fact, in terms of look and feel, it seems that the Sony and the Grundig are in direct competition. The radios are both around $140.00 and have a similar feature set and are around the same size. The Sony wins in most categories, especially the memory department, with 100 presets, although it's not as easy to program and recall stations as it is on the G4000A.

It also has extended FM tuning range (as do the 1103 and the G5). I also have noticed over the years that this radio and its predecessor, the ICF-SW7600*G,* have been mentioned numerous times in *MT*'s *Below 500 kHz* column. As I felt that the other three receivers were somewhat lacking in either frequency selection and/or sensitivity in the longwave bands, I wanted to see why the Sony models were so often the radios of choice in this range.

A quick survey of beacons answered my question: This radio is by far the best performer in the LW bands over the other three, and is quite strong on the AM side, too.

On sideband, the Sony also outshines the other radios with one simple feature: in addition to a fine tuning control, it allows the user to select upper or lower sideband via a switch. The other radios have a general sideband switch and a fine-tuning knob only. Selectable upper and lower sideband is a big help when pulling in sideband signals if multiple transmissions are happening on one particular frequency (as in listening to hams).

However, the outstanding feature on the Sony 7600GR is the selectable synchronous detection mode. I've read and heard arguments

By Larry Van Horn
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The Uniden BC-RH96 Remote Head

I am probably no different from a lot of other scanner enthusiasts: I like to take my scanners with me in the car when I motor around town or on vacation. But I also have a better half who doesn't like me permanently mounting my base/mobile scanners on the dashboard and ruining the appearance of the family chariot.

I also don't want to be a safety hazard on the roadways because I am constantly looking down at the scanner to see what I am monitoring. So, for this reason I do not like mounting my scanners at any eye level lower than the bottom of the window.

Given all this, I was a happy camper when Uniden released their new BC-RH96 remote head, and it has proven to be a good logical solution to both of these issues.

The BC-RH96 is a nearly full-featured remote control head for the Uniden BCD996T and BCT15 base/mobile scanners, and the BCD396T and BR-330T handheld scanners. It controls all scanner functions including volume and squelch. The only exception is that the remote head will not support powering these scanners on or off.

It provides a large, easy to read LCD display with adjustable backlight and contrast controls for the orange-colored backlit display and keypad. For the two Uniden handheld scanners, this remote head can serve as a large LCD viewing screen.

It automatically recognizes the scanner interface baud rate for reliable communications between the various Uniden units mentioned above. It will also emulate your mobile scanner's Close Call and Alert LED signals if you have programmed the scanner to do these functions. All you need to add is a separate speaker for complete remote operation.

The remote head provides you with three shortcut keys that you assign to the operations you use most often. If you use your remote head with more than one scanner, Uniden includes two small laminated cards (printed on both sides) that graphically show the keyboards of each of the four scanners it operates and a place for you to record which commands you are using the three shortcuts for.

On the back of the remote head there is a jack the user can use for installing firmware updates (it faces downward). And there are also channels on the back of the head for routing the control and power cables.

❖ What's in the box?

In addition to the BC-RH96 remote head, accessories in the box include a steel mounting bracket with attachment washers that are factory installed; mounting hardware (screws and washers) to attach the bracket; threaded knobs to allow mounting the remote head quickly to the bracket; remote connection cable between the scanner and remote head (10 feet in length); correctly polarized cigarette lighter adapter to let you connect the remote head to that outlet in your vehicle; owners manual; the two aforementioned pocket-size quick reference configuration cards; and a self-adhesive cable clamp.

The manual is well written and should be studied to get the most out of the BC-RH96 and understand all of its operations.

❖ Overall Rating and Final Thoughts

First, before you install this unit, I want to point out a safety issue you should consider. Avoid placing this unit in any airbag zones when mounting it in your vehicle.

I have seen some complaints on the Internet newsgroups about the lack of a speaker. Personally, I don't want the speaker built-in; I want to make my own choice of a speaker and where to place it in my vehicle for optimum sound reproduction.

Others have complained that the 10-foot scanner interface cable is too short in some installations. This shortfall can be easily overcome by purchasing an iPod extender cable with male and female mini plug connectors.

Another common complaint is there is only one color LCD screen. Yes, this is true, but at least it is a good color (orange) and not blue, like that used on the BCD-396T LCD screen and keyboard backlight.

Finally, there is the on/off power control issue. I understand why Uniden did not include this, since we are dealing with two different voltage levels, depending on which unit you connect the remote head to – 6 volt handheld or 12 volt mobile.

I am sure overcoming some of the engineering associated with this issue would have added to the cost of this accessory. So, I recommend tying in the scanner to the ignition system so that starting the car or going to the accessory position turns on the scanner.

I also should point out that you will need two sources of 13.8 VDC if you use the remote head in your mobile with either the BCT-15 or the BCD996T scanner. One, of course, is for the scanner and the other one is for the remote head. If you use the remote head with any of the scanners in a base setup, you will need a 13.8 VDC power supply hooked up to the remote head in order to operate the unit.

Overall, this is a well-engineered unit and will be a welcome addition to your mobile or base monitor post if you own one of the new, compatible Uniden scanners.

The Uniden BC-RH96 (ACC 98) is available from Grove Enterprises (1-800-438-8155 or **www.grove-enterprises.com**) *for $199.95 plus shipping.*

ON THE BENCH

PROJECTS, REVIEWS, TIPS & TECHNIQUES

Getting that Rig Back on the Air

By Arthur R. Lee WF6P

One day while changing frequencies on the 40 meter band, the digital readout on my ICOM IC-761 finally gave up on me and went totally blank. I had been working a station on the Baja Maritime Mobile Net (7.233 daily at 0800 PST/PDY). I slowly crept down the band until I recognized my station calling me – N6NUN, from his 53 foot cabin cruiser moored in Sausalito, near San Francisco. While I had my normal frequencies stashed in the memory circuit and could still transmit and receive, it was distracting to be unable to read the frequencies.

For the previous six months or so, I had been forewarned of impending failure. On occasion, the readout would blink a few times, then flicker off. A gentle tap on the top of the rig would always restore the readout. Even my wife, AB6XJ, knew where to give the case a friendly thump or two. As time went on, our taps became harder and harder to get the desired results.

The ICOM 761, a very reliable piece of ham gear.

Rather than risk using a bigger hammer and denting the rig's case, I decided to substitute my backup rig, a 25-year-old Kenwood 930S. Putting the old rig back on the air meant I had to reread the manual. The bells and whistles I enjoyed on the ICOM were not state-of-the-art when the 930S was invented. With misgivings, I slid the ICOM to the "Needs Work" shelf to gather dust.

After a year of walking past the ICOM,

Tuning is much easier when you can read the frequencies.

pangs of guilt overcame me. Letting a nice piece of gear like that lay around fallow was criminal. I resolved to fix it or ship it off to the manufacturer for repairs. Through conversations with ham pals, both on and off the air, I was convinced that some simple work with a soldering iron was all that was needed. The consensus was that a cold solder joint was the culprit.

Out of the blue, I received a landline from an old ham buddy, Gary Baker, N6ARV. He is a former Navy electronics technician and computer designer and was stopping in to see me. I told a small lie, that I was about to work on the faulty rig. I knew he'd help, but after all, I really was going to work on the rig – and sometime soon.

When he got to my house I had the rig sitting conveniently on the kitchen table. I had my electrical toolbox at the ready. Together, we started in to disassemble the case. At first we tried to remove the front panel, then decided that the top cover would serve us just as well. With that off, and the speaker connection disconnected, we were able to get to the display unit, its power supply and circuit board. There wasn't much room to maneuver the display unit out from beneath and behind other components, but with a great deal of care and patience and lots of jiggling, it finally came free.

With the circuit board exposed, it was time to check for any abnormality. Using a large magnifying glass and strong flashlight, Gary examined each of the nearly 60 or so connections, finding at least three that were suspect. These were *tiny* connections.

With the aid of my 15 watt soldering iron, the solder was heated at each joint and more added. My spool of solder, although small in diameter, was nearly too large for the fine work

With the top cover removed, most components can be reached for service or inspection. The readout component is shown in the upper left hand corner of the photo.

required. Gary used a wet sponge to wipe the iron's tip clear of extra solder and flux. With an expert dab here and there with the soldering iron, the solder joints smoothed out. Fortunately, I had an almost-never-used solder sucker I had purchased from Radio Shack years earlier. It now got used to a great advantage. Nice, shiny solder connections were made, with due caution exercised to avoid any cross connections from the circuit board traces. We made the final inspection of the entire board, checking each connection until we were satisfied that no more needed attention.

Next, with a toothbrush dipped in rubbing alcohol, the circuit board area was scrubbed clean of all flux surrounding the joints. The board was dried with a soft cloth. This latter process was new to me. (I am told that commercial cleaning formerly used methyl ethyl keytone [MEK] until it was banned.)

I was a bit surprised when we put the readout unit back in the chassis, then replaced the outer case. What if our repair didn't work? Gary didn't seem to have the least doubt that we solved the problem. I was a bit pessimistic as he said, "OK Art, now plug in the power cord." I did as directed and turned the rig on. Voilà!

The display lit up like a new Christmas tree. I was a very happy person. Not only had I learned a few tricks about circuit board repair, but the rig was now back in operation. Rejoicing, I immediately got on the air with it, working dozens of stations. In my mind, I imagined that the incoming signals were clearer than that offered by the Kenwood. This may have only been a psychological reward for the work we did, but I really felt good – until the next day.

❖ Déjà Vu

Back on the air again, the digits on the display began to act strangely. When changing frequencies, the readout would jump dozens of digits or repeat odd frequencies. Oh no! Not another trip inside the rig!

I felt pretty down until I remembered that half the fun of being a ham radio operator was in building or repairing our own rigs. Sure, I did all that back in my high school years when taking radio shop classes. Soldering leads to tube bases with a 200 watt American Beauty iron was duck soup. Just a quick touch and the job was done. Back then there was always that nice smell of smoking flux and burned hookup wire insulation.
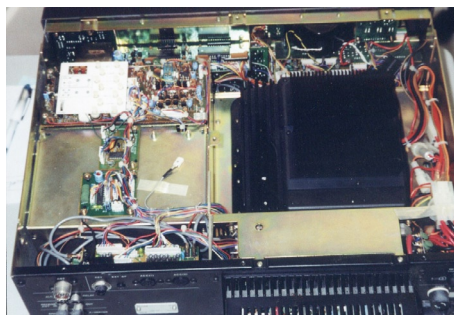
Now, I had to use a 10 power magnifying glass and bright light to see the connections. Even a 15 watt pencil type soldering iron is nearly too large. Using a couple of dental picks, I scraped away even the most minute track of dirt, solder or flux from the repaired connections.

The toothbrush and alcohol scrubbing is something we never dreamed of when soldering resister and condensers to terminal strips, components, or each other. If we got our irons to heat the heavy chassis to just the right temperature, we could solder our connections direct for a good ground. That had the advantage of reducing unnecessary wiring. "Just don't let the excess solder run down on too many components," our shop teacher warned. A splatter of solder here and there was permissible as long as we didn't short out anything in the process.

❖ Second Time's a Charm

So back into the ICOM I went. This time the display unit came free a bit quicker than the first time. I inverted the unit and went through the examination process once again. Taking my time on my repair bench, I went over each soldered connection. Gary had resoldered a through-board

The author, back on the air and enjoying an evening operating his repaired rig.

connection that had looked questionable. There was some flux that bridged the connections between the circuit board traces. I scraped these clean, and, with a dental pick, pressed hard on each connection. There was no further evidence of visible problems and I decided against resoldering all the joints, lest I cause more problems than I solved.

With another alcohol scrub down, followed by a dry brush scrub down, I replaced the display unit. Things went back together much more quickly than before. This time, however, I did not replace the outer case until I gave it the power test. With power on, I was delighted to find the readout back to normal. Whew!

With the rig back in its proper place at my operating station, I happily worked a dozen stations over the next few days. As I sat in my California QTH, a fellow in Moscow, Idaho, with a good CW fist, gave me a favorable signal report. His weather was 25 degrees F and one foot of snow on the ground. A shiver ran through me as I thought back to my three years of New Jersey's winters. My shack was a comfortable 72 degrees as I sat there in my pajamas and slippers, tuning up and down the band while admiring my crispy-clear blue frequency read out digits. It was pure bliss!

over the years that synchronous detection is a "gimmick" or "glorified sideband." I found neither to be the case. Although, technically, it does borrow its basic operational principles from a sideband detection circuit, in actual use, it's quite different. It not only boosts weak signals, it smoothes out moderate and strong signals as well. It meets its goal of evening out the peaks and valleys of reception of both groundwave and propagation path signals.

Running the Sony and the Grundig G4000A side-by-side using just the whip antennas, I was able to pull in weak stations with the synchro switch on that I simply could not hear at all on the Grundig (like Belarus, for example). It is quite amazing.

Of course, all good things come with a downside. With the synchro switch engaged, the level of background noise increases slightly. But not nearly as much as it would with an active amplifier hooked up to the antenna. The synchro mode also brings an unadvertised advantage with it. Although the Sony (and the other three radios) have "high-low" tone switches, when listening to a medium to strong station, if the synchro switch is on, switching between upper and lower sideband (even though you're not in sideband mode) gives two additional tone selection choices. No, it's not as good as having a DSP circuit, but it helps.

With all this great reception, my big question with the Sony is: why doesn't it have a signal strength meter? Although it will tell you via the LED readout when a signal is strong enough for synchro mode and will automatically lock to it (if synchro is switched on), there is no other indicator of signal strength. I found this somewhat frustrating in a radio this advanced, but certainly not a deal-breaker.

This is also the only radio of the three where a power supply has to be purchased separately

from the unit. Although this is another drawback, batteries seem to last a bit over three weeks when using the radio daily. So this has not been a problem.

FEATURES:
o AM(LW/MW/SW)/FM Stereo Reception
o 10 Key Direct Access™ Tuning
o Short Wave Guide Book
o PLL Quartz Frequency Synthesized Tuning
o Hold Button
o Compact Antenna
o Synchronous Detection Circuitry
o Auto Scan Tuning/Memory Scan
o SSB Reception
o 1 kHz Step Tuning
o 100 Station Memory Presets
o World Time Clock/Dual Clock

RATINGS (0-10 scale) Sony ICF-SW7600GR
Audio Quality	8
Battery Consumption	8
User Interface/Ease of Use	7
Overall Features	8
Overall Reception	9
Longwave Reception	9
Construction/Initial Quality	9
Long Term Quality	8

❖ Rounding the final turn, the winners are:

Picking a winner among these radios is tough. If based on ratings alone, the Sony would win. However, each radio is unique enough to make it stand out on its own, and if I were more careful with how I handled my portables, some of the problems listed above might not have occurred.

If genetics were the basis for my decision, since the Kaito and the Grundig G5 come from the same family, I'd give the Kaito the slight edge, because of the easier user interface and its superior access to the presets. However, I haven't owned the G5 long enough to know if

tuning knob problems will pop up. But so far, so good.

Putting the Grundig G4000A and the Sony head to head, the Sony has a slight edge in terms of features. However, I have been very happy with the G4000A over the years. To borrow some terminology from horse racing, overall, it's a photo finish. Although I would buy any one of these radios again, the results of this tight race look like this: (1) The Sony ICF-SW7600GR, (2) the Kaito 1103, (3) the Grundig G4000A, (4) the Grundig G5.

Luckily for the consumer, in the range of $90-$150 radios, all bets are safe.

Mac Radio Programs …
No Right Clicking Allowed

Over the fifteen years that I have been writing this column, I have received questions from readers concerning radio software for Apple Macintosh computers. Unfortunately, all I could do was direct the reader to Mac software titles and sites that I discovered in my Internet searches. Until recently, my only access to Apple computers were real oldies (Apple 2 & 3). But, things have changed, at least temporarily.

Over the past few months I have become involved with teaching science courses in the US educational system. (A shocking eye opener in iteself for someone like me, who has lived, worked and interfaced with educational institutions in Europe and Asia.)

Entering the US educational industry is like entering Appleville: The Mac is king. Why? I'm not sure. But it's an excellent business strategy. "Get them while they are young and you'll have the customer for all their life" …or until they widen their experiences...

For the past five months I have been almost completely based on a MacBook Pro, except for writing this column. So, we are going to take advantage of my Mac and try some radio monitoring programs firsthand. Ready for the first bite?

❖ The MacBook Pro 1.1

This laptop computer is a real departure for Apple. It is based on one of Intel's latest dual core 2 GHz processors with 1 GB of RAM and a bus speed of 667 MHz. In the past, Apple computers did not use Intel processors, since they carried the stigma of the PC and Windows. That is, until now. This machine can run both Mac X v10.4.8 operating system (OS) *and* Windows XP.

Since running Windows is strictly "Verboten!" at my educational institution, I wouldn't dare run BootCamp (available for free at **www.apple.com/macosx/bootcamp/)**. This program allows you to install and run XP on the MacBook Pro.

I am impressed with a number of features on the MacBook Pro – the performance of the 15 inch LCD screen, keyboard action/illumination, and the convenient arrangement of port connectors on the sides of the laptop instead of the hard to reach back. The case, with its glowing apple on the cover, is quite thin.

Having a thin Hollywood profile, however, may have been done at the expense of mechanical robustness. The case feels like it flexes under its own weight when picked up from a side. This is not good for surface-mounted printed circuit board construction and may lead to expensive repair bills. Time will tell. My overall impression is that it performs well; equal to other laptops in

the $2000 price range.

Now to the programs! Searching the Internet for Mac software, I discovered about twenty radio related programs. Of these, I downloaded and ran ten. We will take a quick look at five of these. Let's start with two digital signal decoder programs: cocoaModem, version 2.0, and MultiMode, version 5.8.0.

CocoaModem

The cocoaModem takes its name from the MacOS X's Cocoa framework, the object-oriented application environment in which the program was written.

The main screen of this free program is seen in Figure 1 decoding a RTTY signal. The two perfect ellipses in the small display in the upper left indicate that the mark and space signals are perfectly tuned. Of course, the legible RYRY CQ message being decoded below the tuning display also verifies its correct operation.

Adjusting the frequency of the "listening"
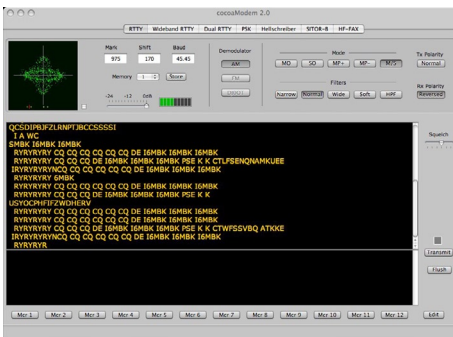
Figure 1 –Decoding a RTTY signal using the "cocoaModem"

band is done by typing a frequency in the box to the right of the small display. To decode RTTY, I started by calling up the RTTY Monitor, which displays a frequency graph of the received signal. The listening bands are shown as red vertical lines. Noting the actual frequencies of the mark and space peaks on the RTTY Monitor, the user adjusts the program's frequency band to match the lower frequency of the signal peak. Then a shift value is entered to locate the second peak. When the program is correctly tuned, the red vertical line will lie on top of the mark and space audio peaks. The program can store four sets of audio frequency data. Alternatively, the user can tune his receiver so as to have audio tones match program's audio frequency settings.

Other modes the program can decode include Wideband RTTY, Dual RTTY, PSK, Hellschreiber,

SITOR-B and HF-FAX.

CocoaModem was easy and simple to install and operate. Once locked on the correct audio frequencies, the decoded text stream stayed solid. One minor problem that I did encounter was while using the RTTY configuration screen under the Windows menu. When I chose "Sound File" in the Test command, the program sometimes froze at the end of the sound file. This required re-starting the program and loss of decoded messages. However, no problem was encountered using live audio. Perhaps it was a problem with my sound file or (dare I say it) iTunes' program?

I liked cocoaModem. It is a very smooth running and useful decoding program. An automatic frequency lock feature, which would eliminate hunting for the correct audio frequencies, would be a nice addition. CocoaModem has both receive and transmit capabilities, making it attractive to both hams and SWLers. I suggest you Mac-ers give cocoaModem a try. It can be downloaded free from **http://homepage.mac.com/chen/cocoaModemPage/index.html**.

MultiMode

The other Mac decoder program I ran was MultiMode version 5.8.0 from Black Cat Systems, **www.blackcatsystems.com/software/multimode.html**. This program can decode an impressive list of signal types: CW, RTTY, SITOR A, SITOR B NAVTEX, WEFAX, Packet, ACARS, SSTV, PSK31, Hellschreiber, SelCal, ALE, DTMF, EIA, CCIR and CTCSS tones. Many of these modes also have transmit capability.

MultiMode's decode of the same RTTY signal is shown in Figure 2. The main screen is quite basic with an audio scope screen at the top right. Note the three vertical bars, which indicate the current "listening" frequencies of the programs. These can be adjusted by entering values in the boxes to the left of the frequency "scope."

This program also was easy to install and operate. Once the user adjusted the frequencies to match the audio peaks, decoded messages were solid and steady. However, achieving this setting
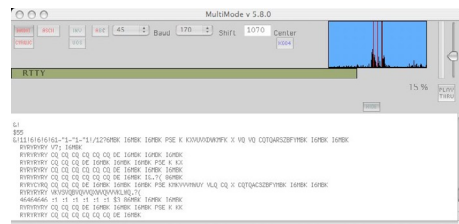
Figure 2 – MultiMode's Main screen also decoding a RTTY signal

seemed to be more difficult and time consuming in MultiMode as compared to cocoaModem. The program's jerky display rate may have contributed to the problem.

Overall, quick tuning of a signal posed a bit of a problem. However, MultiMode's large number of decoding modes is a *very* compelling incentive. Again, an autotuning feature would be a big user benefit.

You can download a working demo version from the above website. A full version costs $89. A "Lite" version that only decodes FAX, CW and RTTY is available for $39.Their site contains additional Mac radio programs including the next one we will run.

DXToolBox OS X

This is another offering from Black Cat Systems. Let me start by saying that I was fascinated for hours exploring all the capabilities of the program. It is billed as a "Shortwave / Ham Radio / HF Radio Propagation" program, but its title does not do it justice. It really does so much more, grabbing and displaying data from many sources.

Trying to show you the basic screens, reports and plots would take over twenty figures! We'll try to give you a quick overview.

First off, it has 12 main windows! And some of these windows have 20 sub choices. The amount and type of astrophysical and geophysical data that DX Toolbox gathers and displays is incredible! Take a look at Figure 3. This screen shows the Maximum Usable Frequency (MUF) at *every* location on the Earth in *real time*! The display can be updated with a click.

Using a dial-up connection to the Internet takes about three minutes to download this screen. One look at your location on the screen and you'll know which bands are best bets for communications at the moment from your location. The MUF at the target station location is another key factor that can be determined from Figure 3.

This is just one of eighteen different images
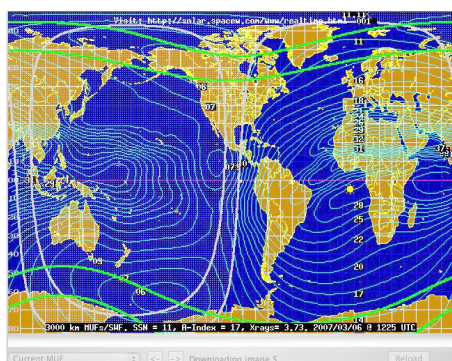
Figure 3 – Maximum Usable Frequencies (MUF) at locations on the Earth in real time! DX Toolbox in action!

that can be obtained including *real time* images of the Northern Aurora (Figure 4) and the F2 layer of the ionosphere over the North Atlantic (Figure 5). The vertical bands in Figure 5 correspond to maximum usable frequencies (MUF).

Figure 4 is very interesting since it shows the intensity of charged solar particles, accelerated by the Earth's geomagnetic field and then interacting with the ionosphere. If we were in the locations

that are colored red/yellow in Figure 4, we would enjoy a beautiful light show in the sky.

We have just touched the surface of DX Toolbox. Some additional program features include the display of current conditions summary, weekly highlights and forecasts, electron flux, proton flux, solar winds and many, many

Figure 4 – The Northern Aurora as seen from on top of the North Pole in real time in Dx Toolbox.

more screens, images and reports. After a few hours of use I'm still discovering new features. Download the free time limited demo version from the Black Cat Systems website at **www.blackcatsystems.com/software/dxtoolbox.html**. But be careful, or you'll become an ionosphere junkie. The registered, full version of DX Toolbox is $24.99 and is available for both Mac and Windows.
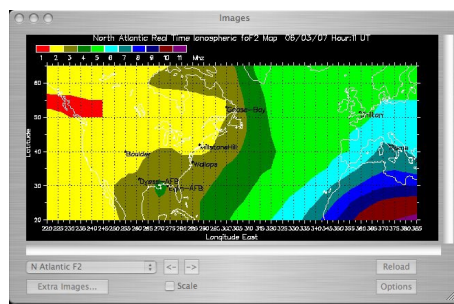
Figure 5 – The F2 layer of the ionosphere over the North Atlantic. Vertical bands correspond to maximum usable frequencies (MUF).

SignalScope

In past columns we have covered programs that turn a Windows PC into a useful electronic instrument, such as an oscilloscope. Due to the limitations of the computer's circuitry, the maximum frequency of operation for these instruments is in the high audio range, 30 kHz. Similar programs have been developed for the Mac.

SignalScope, version 1.8.5, turns the Mac into a sophisticated dual-channel signal display instrument. Three modes of operation are possible: FFT Analyzer, Spectrogram, Oscilloscope and XY Plotter. User adjustable controls include vertical
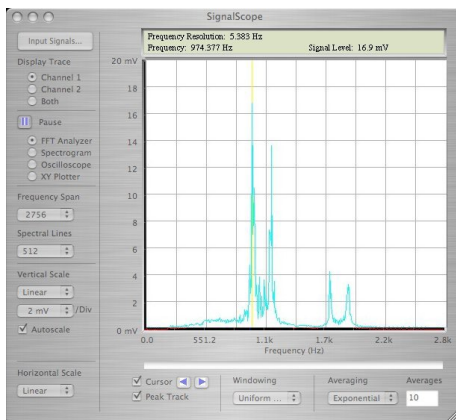
Figure 6 – SignalScope's FFT mode displaying a RTTY signal

scale and linearity, frequency span, horizontal scale and auto scaling. Signal levels and signal frequency are displayed in real time on digital displays. Figure 6 shows SignalScope in the FFT mode displaying a RTTY signal. Notice the two distinct mark and space peaks at 974.377 Hz and approximately 1160 Hz.

SignalScope's display update is *very* fast and results in smooth curve generation. A feature limited demo version is available at **www.faberacoustical.com/SignalScope/**. The cost of the full version is $59.00. A Pro version is also available at $99.00. This site lists other interesting Mac X programs.

Tone Generator X

This program is simple, free and useful. On the program's only screen, Figure 7, the user chooses the Waveform Type from sine, sawtooth, triangle or square. The frequency in hertz is entered by the user or selected from a list of presets.

Finally, the Frequency Type is selected from Tone, Tone Sweep, White Noise, Pink Noise, Blue Noise and Brown Noise. The program gives an excellent definition of each of the "noise" types. This free program is simple to use and very useful for all types of audio testing.
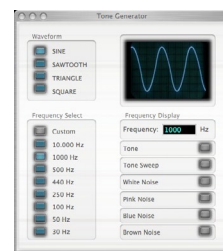
Figure 7 – Simplicity Itself - Tone Generator X's only screen

Tone Generator version 1.0.2 can be found at **www.macupdate.com/info.php/id/13872**.

❖ A Byte of Mac

After using the MacBook Pro for five months there are "PC Windows" things I still miss. When I need to copy or cut text, I still reach for a right mouse click. But the Mac only has one mouse button. Commands such as copy, cut or spell check have to be accessed via keystrokes or menus. It really is much more time consuming and inconvenient as compared to a Windows' right click.

I found MacR-1000 version 1.0 at **http://software.manoverboard.org/**. This program controls an ICOM PCR-1000 and does a nice job of manipulating the receiver's EEPROM. For full functionality a registration cost of $21.95 is required. However, due to the lack of a 9-pin serial port on the MacBook Pro, I could not interface it to the radio.

Yes, I know USB interfaces are available. But, who needs yet another interface cable?! To be fair, the lack of a 9-pin serial port is not unique to the Mac. Recently I used a Compaq 700 laptop, which did not have one, either. But then, I only paid $130 for the used 700 at a flea market.

I hope everyone found it interesting to journey to the Mac side to see what is available for radio people. And perhaps those of you running Mac X OS will enjoy using these programs. For me, using the Mac has been fun. But as soon as I can get away from having to use a Mac …this doctor is going back to my Windows XP (not Vista) PCs. I want my right mouse click back!

Foreign Language Recognition

In late 2006, Ian McFarland introduced a two-CD set of short-wave station IDs and interval signals, drawn from his 24 years with Radio Canada International. At the recent 20th Winter SWL Fest, Ian introduced a second set of two CDs which provide a little nostalgia along with a valuable language resource.

CD#1 is a Foreign Language recognition course which was presented by Dr. Richard E. Wood on the Radio Canada SW Club program. Sixty-eight different languages are presented in 10 different language families or geographic regions, along with tips you can use to help you identify the language being spoken. Once you know the language, the time of broadcast, and the frequency, you are well on your way to identifying the station you are listening to.

CD#2 is a bonus containing three full-length programs selected for their enduring significance. The first show commemorated World DX Friendship Year 1973, with greetings from noted DXers from around the world. The second program on the CD celebrated the 80th anniversary of the first radio broadcast by Reginald Fessenden. It is particularly appropriate to resurrect this nicely-produced show, since we just celebrated the 100th anniversary of this event in December 2006.

Last, but not least, is a look back at RCI's history, which Ian produced in 1985 for the 40th anniversary show.

Series #2 is available by visiting **www.dxer.ca** and printing out the pdf order form to mail in, or by PayPal sent to *listeningin@rogers.com*. Prices are $10 to Canada ($11 via PayPal); $12 to USA ($12 via PayPal); 13 Euros to Europe, or $15 US dollars elsewhere. Send to: Ian McFarland, 6667 Beaumont Avenue, Duncan, BC V9L 5X8, Canada.

Best of all, the net proceeds from the sale of these CDs are being donated to the local Food Bank in Duncan, British Columbia, a registered charity where Ian Mc-Farland volunteers. (And to which the proceeds of the silent auction at Winterfest were also donated.)

Tourist Trains

Kalmbach Publishing Co., publishers of *Trains* magazine, has compiled a unique travel reference in the *Tourist Trains Guidebook*. Listed by state or province, the book includes detailed information about the best tourist trains and rail museums in the US and Canada, along with a directory of nearly 300 train rides, museums, and historical depots – many with pictures.

The 150 highlighted attractions include a little background description, best features, when to go, what's worth doing, how to get there, and other sites worth visiting while you're in the area. All the listings are also indexed for easy use. Among the advertisements at the beginning of the book, you'll also find a discount card valid at many of the listed attractions.

This 277-page soft-cover book is available in hobbyshops and bookstores, or direct from Kalmbach in Waukesha, WI, for $18.95. To order direct, call (800)533-6644 or visit **www.kalmbachbooks.com**.

Orbcomm Plotter

Have you ever wanted to intercept and decode a satellite downlink signal? Now, thanks to Bev M Ewen-Smith and the Centro de Observação Astronómica no Algarve (COAA), you can decode downlink signals from some of the easiest to monitor satellites with a new software decoding package called Orbcomm Plotter. This new software is designed to decode the VHF downlinks from the Orbcomm satellite constellation.

Orbcomm is a satellite communication system (**www.orbcomm.com**) providing two-way data and positioning service to small, portable, user terminals in the VHF High frequency band. You can use a simple VHF radio receiver (scanner) tuned to the band between 137 and 138 MHz to pick up the strong signals from these satellites. With Orbcomm Plotter you can decode the telemetry and find out the positions of the satellites, their operational status, and their uplink and downlink channels.
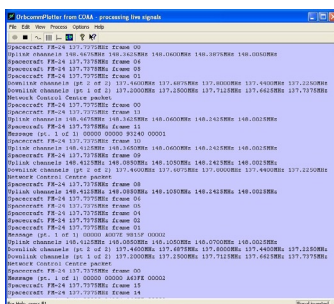
Orbcomm Plotter decodes transmissions from Orbcomm satellites using the sound card in your PC (Pentium level PC running Win95/98/Me/2k/XP with compatible sound card). You will also need a suitable VHF band radio receiver/antenna tuned to the Orbcomm data channels. The program decodes the received digital data, then displays and logs the messages.

· **Signal mode** - displays the raw digital signals on your PC screen in a diagnostic display which helps you to set up the system and adjust the receiver.
· **Message mode** - displays each decoded message in plain language on your PC screen. It displays the identity of the Orbcomm satellite, the operating frequency, UTC date time, position, uplink and downlink frequencies, and coded message traffic.
· **Satellite mode** - displays the operating frequency and last known position of satellites
· **Chart mode** - displays the position of Orbcomm satellites: real-time, history, or prediction.
· **Message log** - stores all messages received and decoded in a text file.

Orbcomm Plotter can be freely downloaded from the COAA website at **www.coaa.co.uk/orbcommplotter.htm** and used for 21 days. After that time it must be registered online for Euro 25 (plus VAT for EU residents) or about US$33 for personal use.

Icom IC-R9500 Now Available

The new, "flagship" wide band receiver from Icom received FCC type acceptance February 23rd. The Icom IC-R9500 is expected in April at dealers like Grove Enterprises – although at $13,500, it may be on the shelf but still out of reach! The IC-R9500 is targeted to professionals for monitoring radio signals and analyzing spectrum, or to high level scanner enthusiasts.

What makes a receiver like this so pricey? Features such as triple conversion, two digital signal processors, digital audio recording, synchronous detection, spectrum scope, ten VFOs, 1000+ memory channels with USB access, and digital twin passband tuning, for starters. The receiver covers 5 kHz to 3335 MHz (less cellular) in all modes. It also offers five IF roofing filters with selectable 240, 50, 15, 6 and 3 kHz widths. The fact that it weighs in at 44 lbs is another indication of rock solid construction.

Detection modes include AM, AM synch (selectable sideband), USB, LSB, CW, FM, WFM. A dual-notch filter provides 70 dB attenuation of two heterodynes with wide, middle, narrow bandwidths.

The R9500 will scan at an approximate rate of 40 channels per second, using various scanning schemes, such as memory, program, frequency, priority, mode, and auto memory write. An optional P25 digital demodulator enables reception of digital communications; however, it is not able to track talk groups in a trunked system.

Books and Equipment for announcement or review should be sent to What's New, c/o Monitoring Times, 7540 Highway 64 West, Brasstown, NC, 28902. Press releases may be faxed to 828-837-2216 or emailed to Rachel Baughn, editor@monitoringtimes.com.

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Blogs offer an opportunity for columnists to share information that does not make their columns. The news might be too timely for deadline, too short, confined to a small geographical area, too far away to be heard in North America, or even off the columnist's regular "beat." Bookmark these blogs for frequent visits!

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MT: MILCOM
http://mt-milcom.blogspot.com/ - by Larry Van Horn
Larry's Monitoring Post
http://monitor-post.blogspot.com/ - by Larry Van Horn
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✳ Neat, look huh? It's just advertising. The radio is actually black. Very attractive, yes. But black. If we had put a black radio on this ad, the headline would not have been as quick to read. So we made up this look. Black is nice. Think of it as seeing the world from the night side. It's still there. You just can't see it. Can't get over it? If you send us $5000.00 USD, we'll make up the radio look just like this for you. Is it worth it? Not to most people. But you're not most people. Are you? E-mail icom@icomamerica.com with "worldPCR" in the subject line for more info. ** Cellular frequencies blocked.

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